1928 Vol. XLVIII DECEMBER 6th, 1945

FLIGHT

and

AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB ONE SHILLING

Two more "milestones" in aviation . . . .
Above: MILES M.28—Three-four seater, cruising speed 155 m.p.h. Take off 150 yards.
Right: MILES MARATHON—14-seater, feeder line plane Range 750 miles. Cruising speed 175-210 m.p.h.
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FLIGHT
and
AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD · FOUNDED 1909

Editor
C. M. POULSEN

Managing Editor
G. GEOFFREY SMITH, M.B.E.

War Correspondent
JOHN YOXALL

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Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

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The Outlook

Unsound Optimism

ADOPTING a defeatist attitude is certainly not the way to get British civil aviation going. On the other hand, just as great harm can be done to the cause by unwarranted optimism. At the official launch of the Short Sandringham at Rochester last week, Mr. A. Woodburn, Parliamentary Secretary to the Ministry of Aircraft Production, expressed certain views which, if they are to be accepted as representative of the Government's attitude, show a complacency for which there is little foundation in fact.

Briefly, Mr. Woodburn argued that although we have inevitably been delayed in our production of commercial aircraft by the wholehearted way in which we mobilised our man-power and woman-power during the war, there are now so many novel ideas and developments coming along that in two or three years' time Great Britain will be well in the forefront. That sounds fine, but there is danger in the very fact that it is true.

We assume that the Parliamentary Secretary had in mind the tremendous progress that has been made in an incredibly short time with jet propulsion and turbine-airscrew combinations, one of which (the Bristol Theseus) is described for the first time in this issue. We believe with Mr. Woodburn that in this sphere Great Britain does indeed lead the world. But the application of these new power plants to operational aircraft is some little distance off, and in the meantime this country has not much to offer in the way of more orthodox aircraft, for which the world is crying out.

In his first Empire lecture to the Royal Aeronautical Society Mr. Hudson Fysh, managing director of Qantas Airways, expressed his full sympathy with the idea of being as British as possible in our aviation, but he pointed out that in the end it would be technical excellence which would be the final test. We know that Mr. Hudson Fysh is trying his best to get British aircraft for Australia, but it is obvious that neither he nor any other operator can wait indefinitely. It may well be that he and others may be forced to buy American equipment, and once that has been done and operations firmly established, the chances of getting British aircraft introduced later are very slim. Once an airline has become accustomed to certain aircraft and engine types, it will require something quite extraordinary to force their replacement. Familiarity, experience and the existence of spares all militate against change. That point, judging from the utterances of the Parliamentary Secretary, appears to have been somewhat overlooked at M.A.P.

That there is a demand for existing orthodox aircraft is proved by the experience of Short Brothers. They have recently delivered the first of four flying boats to South America, have just launched yet another which is going on route tests by B.O.A.C., and have had serious enquiries from certain European countries. This points the way to an export business to which our politicians are so ready to pay lip service, but for the realisation of which they appear to do little or nothing—rather the reverse.

Turbines and Airscrews

CONSIDERABLE experience has been gained by now with jet and turbine units of different sorts, and it is beginning to emerge that as at any rate a first step in powering large and not extremely fast types of aircraft, the turbine/airscrew combination may well become a serious competitor of the piston engine, certainly so in the high-power class.

In the Bristol Theseus described in this issue one of the basic difficulties of operation over a wide range of speeds has been very cleverly overcome by using separate drives for the airscrew and the compressor, and

by a novel control device of which no details may be divulged at the moment. In this way airscrew r.p.m. can be adjusted to give good efficiency for take-off without thereby reducing the overall turbine efficiency.

It is not to be expected that the Bristol system is the only one possible, nor indeed that it is the only one on which work is being done (in fact, the existence of a Rolls-Royce turbine/airscrew combination has been announced), but it is certainly a promising one.

Lord Swinton's Warning

SOME weeks ago, when commenting on Lord Winster's plan for nationalising British commercial aviation, we remarked that what was even more disquieting than the Government's new scheme was the long delay in getting started which would inevitably result. Lord Swinton, in stating the views of the Conservative Party's Civil Aviation Committee, added prospects of still further delays by his pronouncement that the next Conservative administration will hold itself free to dissolve or vary the constitution of any nationalised company set up by the present Government.

While we dislike nationalisation as much as does Lord Swinton, we hardly think his statement was well timed. Commercial aviation is by its very nature bound to be a matter for international agreements, and after the Chicago Conference these agreements threaten to be mainly bi-lateral. It will not help matters if foreign governments have the feeling that British aviation policy may be drastically altered the moment there is a change of Government, even if there is no immediate likelihood of that happening. Moreover, the threatened reversal of policy would, in itself, cause still further delays, the one thing which we cannot afford. To us it appears that the interests of British commercial aviation can now only be served by making the best of a bad job and getting on with the task at once.

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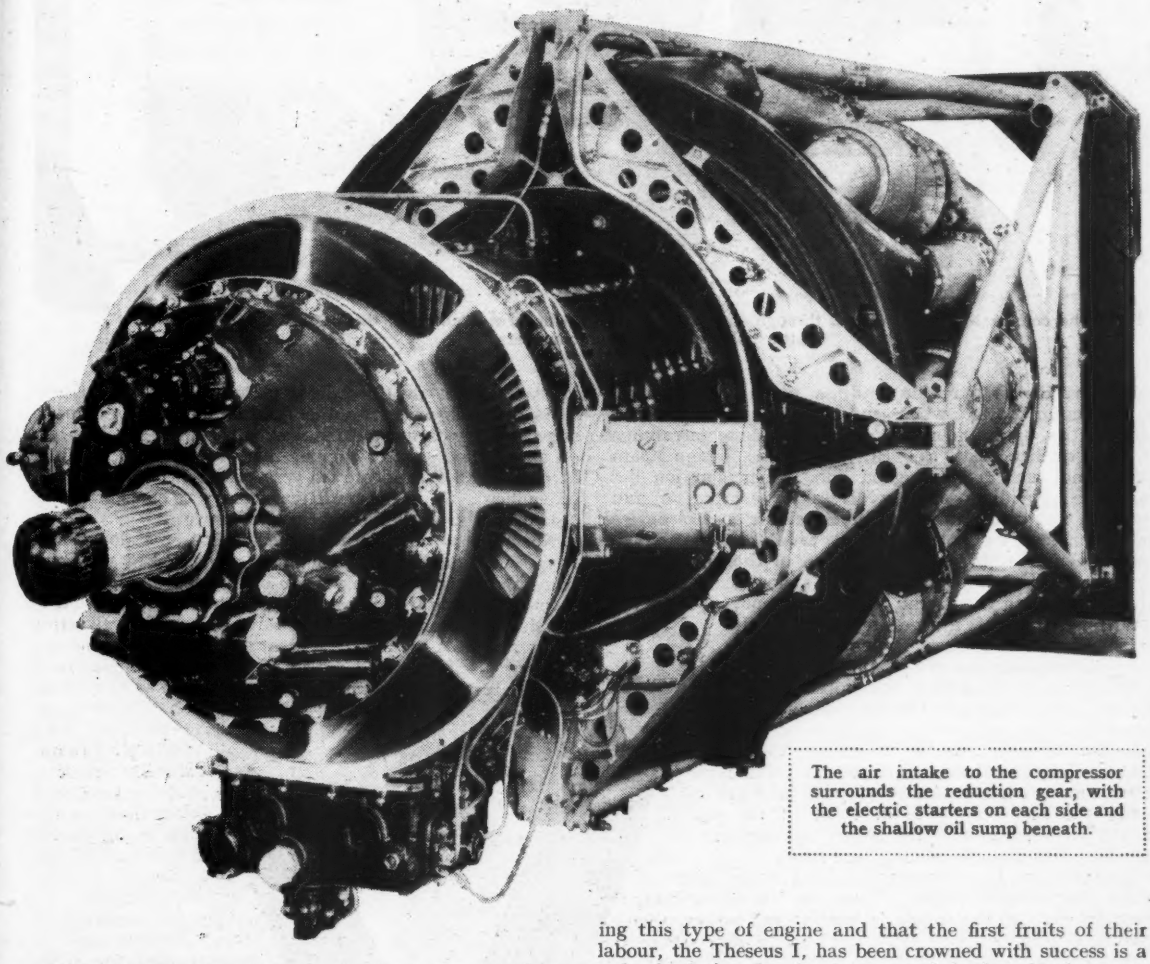
The Price of Progress

FOLLOWING closely upon a series of R.A.F. accidents, the loss of the Handley Page Hermes with her test crew of two, and the death of a Fairey test pilot in an accident to a Firefly I, is a reminder that the air has not yet been conquered. It is necessary to distinguish clearly between the R.A.F. accidents and these other two. In the former it was a case of mishaps to well-tried aircraft types on operational duties. Of the others, in one instance the pilot was making the first test flight of a new type, while in the other the aircraft was a type already in production. The causes remain obscure at present. The loss of three such valuable lives is regrettable, and in addition there must be a certain delay before the second Hermes can be completed and made ready for flight, thus still further postponing the putting into service of one of our all-too-few new civil types.

WITH BRITISH POWER: Canadian-built Douglas DC-4M Skymasters for Trans-Canada Air Lines are to be fitted with Merlin "circular" civil power plants following the company's experience with converted Lancasters on their Atlantic run. Here is an impression of the T.C.A. Skymaster as it will appear when converted. Further details of the interesting development will be found on page 616.

Bristol Theseus I

Gas Turbine/Airscrew Unit of High Power and Low Consumption : Separate Drives for Airscrew and Compressor



The air intake to the compressor surrounds the reduction gear, with the electric starters on each side and the shallow oil sump beneath.

SINCE the inception of the gas turbine for jet propulsion a considerable amount has been heard of the possible use of such a unit as a prime mover to drive a conventional airscrew; in fact, it would not be unfair to say that a weighty body of enlightened opinion holds the view that this combination is likely to prove of much greater overall value than jet propulsion itself.

There are very many aspects peculiar to a combination of this nature which render it particularly attractive as an alternative to the piston engine in the medium- and higher-power categories. Jet propulsion cannot truly be regarded as being in direct opposition to the piston engine (except in certain specialised instances), due to the fact that its form of operation is almost the direct antithesis of the conventional i.c. engine.

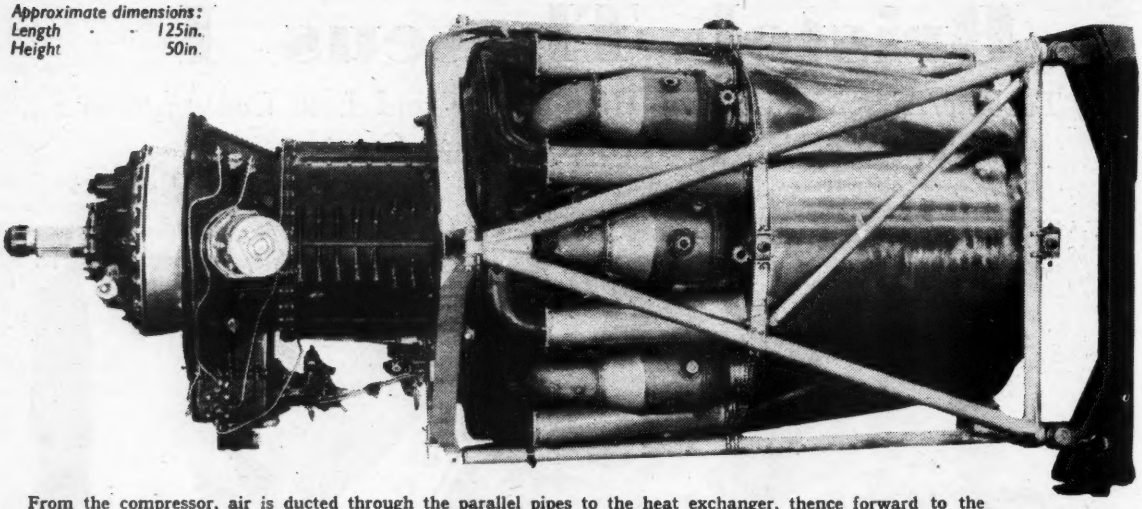
The turbine/airscrew combination is, however, much more than a serious adversary to the piston engine in that it is capable of severely competitive fuel consumption, whilst having the additional advantages of long periods between overhauls, efficiency of propulsion over a wide range, low overall diameter and almost vibrationless running.

That the Bristol Aeroplane Company have been developing this type of engine and that the first fruits of their labour, the Theseus I, has been crowned with success is a very good sign for the future, and further developments will obviously be awaited with the greatest interest.

The Theseus I consists of a compound multi-stage compressor which inspires air through an annular orifice around the airscrew reduction gear, the compressed air then being delivered through a heat exchanger before passing to the combustion chamber, where its temperature is further raised by the burning of injected fuel. The resulting products of combustion pass to a turbine by means of which the compressor and auxiliaries are driven, and thence to a further turbine stage which, through a forward extension shaft, drives the airscrew. After leaving the latter turbine the gases pass through the heat exchanger, where they give up a measure of their heat to the compressed air on its way to the combustion chambers. From the heat exchanger the exhaust gases are finally discharged through a controllable nozzle, so providing a certain proportion of the total thrust.

A feature of all turbines is that they have the inherent quality of optimum efficiency at maximum speed, and, consequently, when considering driving an airscrew by means of a gas turbine the very real problem of obtaining flexibility presents itself. It is also true that a turbine

Approximate dimensions:
Length - - 125in.
Height 50in.



From the compressor, air is ducted through the parallel pipes to the heat exchanger, thence forward to the "bottle" shaped combustion chambers.

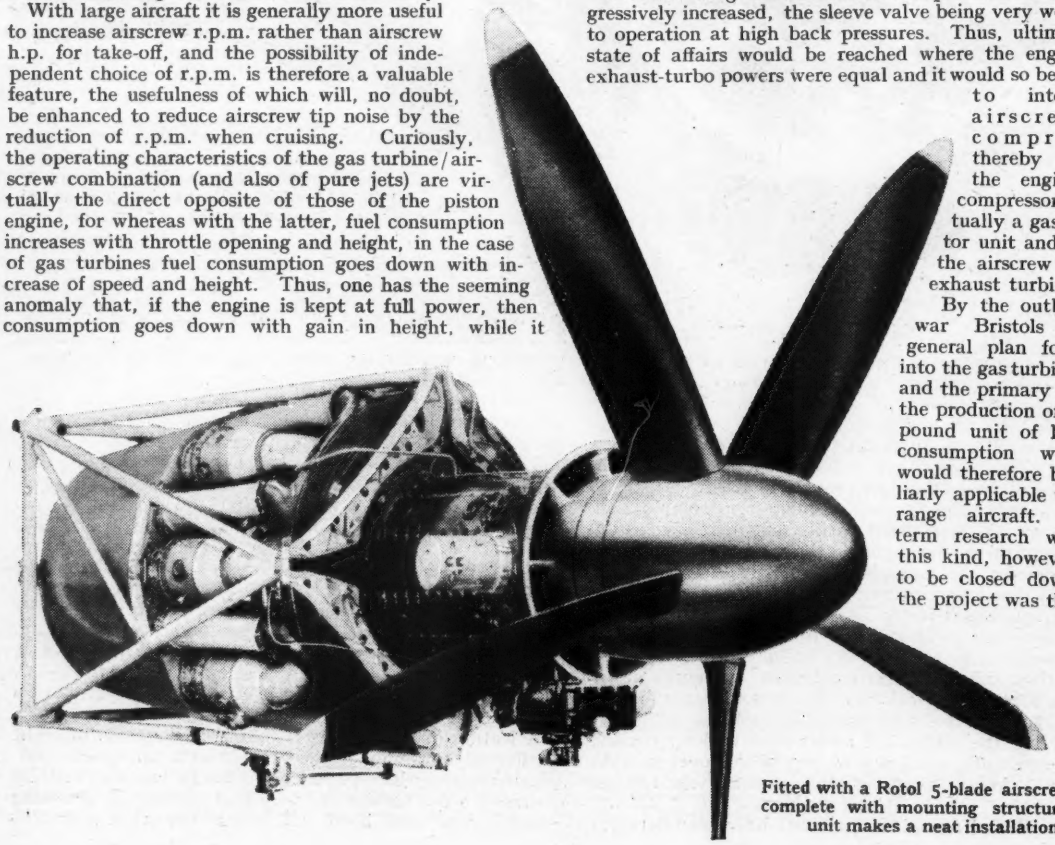
will, nevertheless, provide quite a good proportion of its optimum power when run within a fairly small range of its optimum speed, and it is taking advantage of this quality that the Bristol turbine design team have done such a very good job. Their solution lies partly in providing separate drives for compressor and airscrew, and partly in an extremely clever control device on which we are not permitted to elaborate. However, the net result is that the speed of the independent airscrew drive can be varied over a considerable range without affecting the overall turbine efficiency.

With large aircraft it is generally more useful to increase airscrew r.p.m. rather than airscrew h.p. for take-off, and the possibility of independent choice of r.p.m. is therefore a valuable feature, the usefulness of which will, no doubt, be enhanced to reduce airscrew tip noise by the reduction of r.p.m. when cruising. Curiously, the operating characteristics of the gas turbine/airscrew combination (and also of pure jets) are virtually the direct opposite of those of the piston engine, for whereas with the latter, fuel consumption increases with throttle opening and height, in the case of gas turbines fuel consumption goes down with increase of speed and height. Thus, one has the seeming anomaly that, if the engine is kept at full power, then consumption goes down with gain in height, while it increases when the throttle is closed during level flight.

As far back as 1924-5 the Bristol Aeroplane Company were actually flying a Bristol exhaust turbo-supercharger on an adapted Jupiter engine; this was flown successfully at over 30,000ft. and proved very promising, but the state of engine development made it necessary to concentrate on gear-driven superchargers from 1926 onwards.

No further work with exhaust-turbos was done until 1937, when the line of development envisaged by the Company was a turbo-blown version of the sleeve-valve engine —the idea being that boost and back pressure could be progressively increased, the sleeve valve being very well suited to operation at high back pressures. Thus, ultimately, a state of affairs would be reached where the engine and exhaust-turbo powers were equal and it would so be possible to interchange airscrew and compressor, thereby making the engine and compressor virtually a gas generator unit and driving the airscrew by the exhaust turbine.

By the outbreak of war Bristols had a general plan for entry into the gas turbine field, and the primary aim was the production of a compound unit of low fuel consumption which would therefore be peculiarly applicable to long-range aircraft. Long-term research work of this kind, however, had to be closed down and the project was therefore



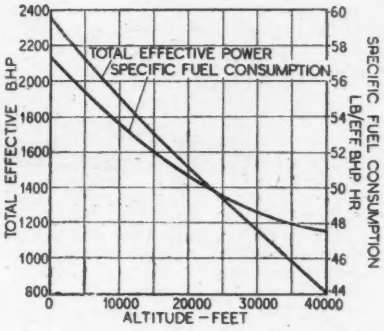
Fitted with a Rotol 5-blade airscrew and complete with mounting structure the unit makes a neat installation.

BRISTOL THESEUS I

discontinued so that attention could be concentrated on sleeve-valve engines for immediate war purposes.

A little later, the design staff became aware of the extent to which Whittle's research had progressed, and the Bristol project team was later accordingly given the job of designing a turbine for long-range aircraft; the target set them at that time was to produce a turbine which would have an overall fuel consumption comparable with that of a piston engine at 300 m.p.h. at 20,000ft.

These conditions were postulated as the lowest speed and altitude at which the turbine could compete with conventional engines; above these speeds and altitudes turbine efficiency increases. Bristols did not believe that the values could be less than these, and 20,000ft. was chosen because pressure cabins were thought inevitable and they would not be worth while at lower altitudes.



As gas turbines have no cooling system other than a small oil cooler for the reduction gear it was concluded that, if the designers could get down to within 5-10 per cent. above piston engine consumption, they could successfully compete with such engines. This was fixed as the full load condition, since turbine performance is most efficient at full power and it was not necessary to provide for any other condition except that of top speed.

A careful study was made of every form of prime mover including piston engines, turbines and jets, and every form of coupling. The result of this was to strengthen the opinion that the idea projected was fundamentally the best for the purpose envisaged. The decision was then taken to concentrate work on the scheme, and the design was settled for a unit of quite high power in which the greater proportion would be taken in an airscrew and only residual thrust obtained from the jet.

The Theseus is only the first of a family of Bristol turbine units in which the primary objective is the attainment of the highest possible thermal efficiency consistent with reasonable weight and bulk, and in this connection Bristols feel that, having initiated development in this direction, they should pursue it in a variety of designs not all of which will necessarily include airscrews and/or heat exchangers.

FLIGHT EDITORIAL STAFF

Pre-war Members Returning from the R.A.F.

THE Editorial staff of *Flight* has recently been augmented by release from the Royal Air Force of two former editorial writers.

A month ago the staff was glad to welcome back Flt. Lt. H. A. Taylor, and this month Wing Cdr. Maurice A. Smith, D.F.C. and Bar, will resume editorial work. Both have had exceptionally varied operational and Service experience during the war.

Wing Cdr. M. A. Smith, D.F.C. and Bar.

Flt. Lt. Taylor learned to fly in 1929 and handled 40 civil types prior to joining the A.T.A. From May to October, 1940, he was C.O. of No. 3 Ferry Pilots Pool, was commissioned in the R.A.F.V.R. in October, 1940, and posted as test pilot in No. 48 M.U. From 1942 to 1945 he was Senior Test Pilot at various M.U.s and was attached to Vickers Supermarine in 1944. He has flown 45 military types, among them Hurricanes, Wellingtons, Beaufighters, Mosquitoes and Spitfires, and including four-engined types, his total test flying hours being 1,378. He will now resume his attention to commercial air transport and civil types of aircraft and their operation, which was his special study prior to his war service.

Flt. Lt. H. A. Taylor.

Wing Cdr. Maurice Smith commenced flying training with the Oxford University Air Squadron in 1934, joined the R.A.F.V.R. and was commissioned in 1937, flying at No. 1 E. and R. F. T. S. On the outbreak of war he was appointed a flying instructor on elementary aircraft in Scotland and England at No. 4 and 11 E.F.T.S., and later under the Commonwealth Air Training Scheme at 31 E.F.T.S. in Canada. After posting to No. 1 F.I.S. he later instructed on various single- and twin-engined types at No. 37 and 31 S.F.T.S. In 1943 he returned to England, and after Beam Approach training, was posted to Bomber Command and took part in numerous night operations over the Continent. Originally with a Lancaster Squadron, he was later engaged in special Pathfinder duties on Mosquitoes and was awarded the D.F.C. and later a Bar to the D.F.C. His broad experience of aircraft includes most types of British and some American trainers, also Wellingtons, Stirlings, Lancasters, Lightnings, Spitfires and Mosquitoes in 2,900 total flying hours. On his return to the office, Maurice Smith, whose pre-war experience included works training on aircraft engines at Rolls-Royce, Derby, has been appointed to assist Mr. C. M. Poulsen, Editor, in a general capacity.

Flight staff will be complete on the return of a third pre-war member, Sqn. Ldr. H. F. King, who has served at the Air Ministry since 1940 and expects his release in March.

NEW POST FOR MR. BOWYER

THE Society of British Aircraft Constructors announces that Mr. E. C. Bowyer has been appointed chief executive of the Society, with the title of director. Mr. Bowyer joined the S.B.A.C. in 1930 to organise the Society's public relations and founded its information department. In 1938 he became principal assistant to the chairman, and early this year was appointed executive in charge of the Society's newly formed export section.

Readers may like to be reminded that the present president of the S.B.A.C. council, who, with other officers, is elected annually, is Mr. A. Gouge. Deputy-president is Major Kilner, and vice-president Mr. R. Blackburn.

FLT. LT. J. C. EVANS

THE death has occurred in a test flying accident near Heston of Flt. Lt. J. C. Evans. He was engaged on a production test flight of a Mk. I Firefly, and the cause of the crash is not yet known.

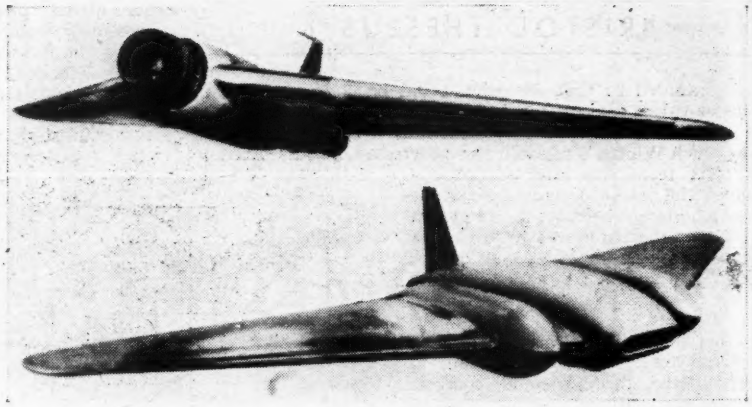
Colin Evans had been a test pilot for six years, and his loss is deeply felt by his friends in the aviation industry and the firm for which he worked. After a short-service commission in the R.A.F., during which he became an A.1 instructor at Sealand, he joined the Redhill School of Flying. At the outbreak of war he went to Boulton Paul, carrying out much early experimental work on the Defiant. Joining the Fairey Aviation Co., Ltd., in 1942, he had been associated with the Firefly since its first stages, and his recent exceptional flying displays at Farnborough and Heston showed how well at home he was with the Mk. IV version of this type.

He was quiet and retiring to a degree, yet he would spare no pains to drive a point home if it would result in a better aircraft; and his patience, both as an instructor and a test pilot, was a quality which inspired admiration in all who knew him and his work.

His epitaph is written in the history of his pupils and the success of the two types of aircraft with which he was so closely associated

F. H. D.

HERE AND THERE



MORE YANKEE DOODLES: Here are two Northrop jet-propelled flying bombs. The upper one is the JB-1A and carries a 2-ton charge in its wings; the lower one is an earlier twin-jet type now superseded.

Death of Mr. Otto Wells

THOSE connected with the aircraft industry in this country and on the Continent who knew Mr. Otto Wells will be very sorry to hear of his death as the result of a road accident.

Otto Wells was chief engineer of the aircraft department of *Aero Tovarna*, in Prague, before the German occupation of Czecho-Slovakia, and, refusing to co-operate with the aggressors, he escaped with some difficulty to this country, together with his wife and young daughter, just before the outbreak of war.

He joined the design staff of General Aircraft in 1940 and was recently engaged on research work with tailless aircraft.

No Tube, No Trouble!

THERE may well be a bright future devoid of punctures for motorists and users of aircraft in the special tyre developed by Dunlops for use in the Burma swamps, news of which has just been released for publication.

This tyre has no inner tube and, therefore, no valve, and the Burma model was squat and broad with a bold "cross-country" tread.

The vehicle to which it was fitted is still, at the time of writing, on the secret list, but it sounds as though it might interest those tough drivers who delight in the fiercer kind of reliability trial.

Canada-Australia Services

R.A.F. Transport Command's service between Canada and Australia, which was due to end last Sunday, will in all probability carry on for some weeks as the result of negotiations between the British and Australian Governments reported by the Canberra correspondent of *The Sydney Sun*.

As the U.S. Pacific air service operated by Air Transport Command of the U.S.A.A.F. is due to wind up very shortly, Australia would be left without an air link across the Pacific to North America unless the R.A.F. service continues. Result of the negotiations will probably have been announced by the time this appears in print.

Activity in India

AN air transport licensing board is to be set up in India next year to co-ordinate development of the country's civil air services.

Making this announcement last week, Sir Frederick Tymms, director-general of civil aviation in the Indian Government, said that the new department would be necessary to prevent uneconomic competition, and to ensure safety and convenience in air transport.

R.C.A.F. Surplus

ONLY one type of aircraft licensable in Canada by the Department of Transport now remains available from the stock declared surplus by the R.C.A.F. This is the twin-engined Cessna Crane trainer and light transport type, of which a large number have already been sold.

Various other types have been sold to purchasers in and outside Canada, including a fair number of Tiger Moth elementary trainers, most of which have been acquired by Canadian flying clubs.

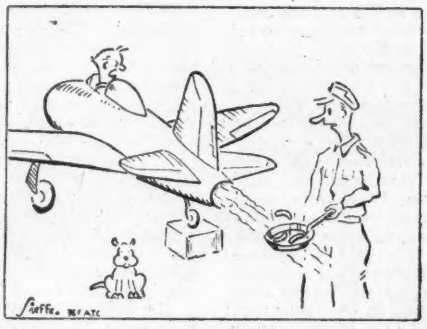
The Christmas Tree

WHEN Air Vice-Marshal Sir Norman MacEwen presided at the opening of the "Christmas Tree" fair in the Rootes showrooms in Piccadilly last week, he mentioned that this was the third year in succession that this annual Christmas fair in aid of "SSAFA" had been held there.

Had the A.V.-M. been given to making puns he might well have said that the SSAFA Christmas Tree now had its roots in Piccadilly.

The fair, which displays a wide variety of articles so attractively that the prices hardly hurt at all, was opened by Air Marshal Sir John Slessor, to whom a vote of thanks was moved by Hilda, Duchess of Richmond and Gordon.

The Soldiers', Sailors' and Airmen's Families Association has helped over 2,000,000 Service families, and its steadily rising annual expenditure reached £450,000 in 1944. It is staffed by 29,000 voluntary workers and is trying to raise £1,000,000.



"'Urry up, George; fuel's running low."

Forty-two B.C. Airfields

ACCORDING to an article recently published in the *Vancouver Sun*, the Canadian Government spent $80,000,000 in giving air protection during the war to the West Coast—that is, to the coastline of British Columbia stretching from (roughly) Prince Rupert in the north down to Vancouver.

It now has to be decided what is to happen to 42 airfields dotted about Canada's Pacific province, and the R.C.A.F., which has the first call, is selecting those it wishes to retain as peacetime establishments.

When these have been decided upon, the balance will be transferred to the Department of Transport which will, in turn, select those "designed to fit into the commercial aviation picture" to be maintained by the department for public service.

Some of the province's big airports may be returned to the cities which previously owned them.

Polyglot Publicity

WHEN a firm becomes world-famous as a manufacturer of something intrinsically spectacular, like an aircraft, any other and smaller things which it happens to make, e.g., aircraft accessories, rather naturally tend to be overshadowed in the public mind.

For example, everybody knows that the Fairey Aviation Co., Ltd., build excellent aircraft, but not so many are aware that the firm was privileged to develop the device which was ultimately adopted as the R.A.F. pamphlet-dropping apparatus used in the later stages of the war. This was only one of a number of such products; the others are still secret.

Fairey accessories which *may* be talked about include pilot's seats with plastic moulded body portion and metal framework designed for mass production; trim-control units; parachute jettison control units; filler caps; fuel drain valves; and quick-release pins. These and other fittings are illustrated and described in a new brochure in English, French and Spanish, which, incidentally, contrives by an ingenious system of half pages to

HERE AND THERE

avoid that typographical muddle which so often disfigures multi-language technical literature. The firm are public-spirited enough to suggest, in the interests of British export trade, that their method might be adoped by others desirous of telling the world what they do.

Low Percentage Loss

IN his third report of the U.S. Army Air Forces, Gen. H. H. Arnold says: "During the entire period of operations the 21st Bomber Command flew nearly 90,000,000 miles to and from the Japanese mainland with an accident loss rate of slightly over one aircraft for every 1,000,000 miles flown. The percentage of airborne aircraft lost on bombing missions dropped from a record of 5.7 per cent. in January, 1945, to 0.4 per cent. in July."

The inclusion of the qualifying word "airborne" in the second sentence presumably refers to aircraft losses other than those sustained in take-offs or by enemy action against U.S. bases.

Dutch Faith in the R.A.F.

A DUTCH woman, whose son was born on the night of June 11th, 1941, when R.A.F. bombs were falling on a German target so near her home that "everything was shaking and shivering" had the child christened Ronald Adrianus Frans so that his initials should be R.A.F. This, she said in a recent letter to the Air Ministry, was because of the faith she and her husband had in ultimate British victory, and she wanted her boy to have a "call name" to be proud of.

In the letter she asks if, perhaps, the Air Ministry could surprise her little boy, now 4½ years old, with a souvenir —"for instance, a model of one of your bombers."

Apparently even Air Ministry officials have hearts, for we are happy to relate that the little Dutch boy is to have his model of an R.A.F. bomber.

Sydney Memorial

THE Air Force Association of Australia (N.S. Wales Branch) has launched an appeal for £500,000 to build a Memorial Centre in Sydney.

The adjacent picture is the architect's sketch of the proposed building which will contain the Association's offices, complete club premises, and a sunken room containing the tomb of an unknown airman.

An outstanding feature is a stained glass window 70ft. high depicting the history of the R.A.A.F. from 1914 to 1945. The building will be surmounted by a glass globe, illuminated at night to form an airway beacon.

The proposed R.A.A.F. Memorial Centre at Sydney with its 70ft. stained-glass window. (See ajacent paragraph.)

News in Brief

TWO squadrons of the French Air Force were recently presented with the Halifax bombers they used against Germany during the war. They were the "Tunisia" and "Guyenne" squadrons, and the presentation was made by Viscount Stansgate at a ceremony at Bordeaux.

* * *

When it was decided at a special meeting of High Wycombe town council to offer the Freedom of the Borough to Sir Arthur Harris and Lt. Gen. Ira C. Eaker (Deputy Commander U.S.A.A.F.) it was stated that High Wycombe was the only town in the world to be "attached by service to the headquarters of both bomber commands."

* * *

The administrative, sales, and accounting offices of Delco-Remy and Hyatt, Ltd., are moving back to the firm's registered offices in London on December 17th, from the wartime address at Dunstable. As from December 13th all communications to this concern should be directed to 111, Grosvenor Road, London, S.W.1. (Tel.: Victoria 6242.)

* * *

The London office address, for home sales only, of A. C. Wickman, Ltd., Coventry, is now 38-39, Stratton Street, Piccadilly, W.1 (Tel.: Grosvenor 2726), and a new department for the sale of surplus and used machine tools will also operate from here. Export sales will still be from 10, Princes Street, Westminster, S.W.1.

* * *

Mr. W. Udall, A.M.I.Mech.E., has been appointed assistant chief engineer of the engineering division of the Brightside Foundry and Engineering Co., Ltd.

Congratulations to the editor of *Tale Spin* (the magazine of 124 Wing, R.A.F. Station, Lubeck) on producing a unit journal with a quite professional make-up—*and* in colour.

* * *

Mr. A. S. Drakeford, Australian Air Minister, announced last week that a jet-propelled aircraft will go to Australia early next year for Royal Australian Air Force tests under tropical conditions.

* * *

The air station at Burtonwood, Lancs, one of the largest from which American Flying Fortresses were operated, is to be taken over by the R.A.F. Representations had been made by the local authorities for its use as a trans-ocean flying base, but it is understood that though it will not be used for that purpose it will still be used as an airfield.

* * *

The management committee of the Aeronautical Engineers' Association recently decided to ask M.P.s to enquire why "the Air Ministry proposes to alter the terms of the workers' contracts of employment in such a way that all protection of their employment is removed and that they lose all rights of representation on workers' committees," and to find whether the Ministry "is being influenced by outside interests antagonistic to the workers concerned."

* * *

Mr. C. H. Bradley, Ceylon's Director of Civil Aviation, went by air last week to New Delhi to discuss the formation of a National Airways Corporation for Ceylon. It has already been decided that internal services in Ceylon should be operated in conjunction with a wider scheme of air transport linking Ceylon and India.

It has been announced from Istanbul, said Reuter last week, that the Turkish Government has decided to establish an Air Department in which will be centralised all services relating to the Air Forces and to civilian aviation.

* * *

A substratosphere flight was recently made by a Russian balloon from the Red Army Central Aerologic Observatory for the purpose of studying cosmic rays and the upper strata of the atmosphere. The flight was sponsored by the Physics Institute of the Soviet Academy of Sciences and the Moscow Lomonosov State University as well as the Observatory.

* * *

The death has been announced of Mr. James Henderson, who recently retired from his directorship of the United Steel Companies after nearly 60 years' association with the industry.

* * *

Mr. J. McDowell, chief purchasing agent at Fort Dunlop, has been elected president of the Ulster Association of Birmingham and District.

* * *

Gen. Earl A. Spaatz, designated as successor to Gen. H. H. Arnold as head of the United States Air Forces, last week urged the establishment of a network of air bases in the Arctic regions as protection against a future war in which, he said, death would travel almost entirely by air.

"Responsibility for our security rests squarely on the nation's air power," declared Gen. Spaatz in an article in *Collier's Magazine*. He pointed out that at present B-29 Superforts can take off from bases below the Arctic circle, fly over the Polar region on a one-way trip, and bomb "every great industrial, political and military centre."

German Piston-engine Progress

Projected Departures from the Inverted Vee-12 and Two-bank Radial Formulae : Planning for 5,000 h.p. : Progress Delayed by Our Bombing

By SIR ROY FEDDEN, F.R.Ae.S., M.I.A.E.

A BROAD review of wartime piston-engine development and production in Germany is instructive, and has certain parallels in British and American history. Although conditions in Germany made it impossible for us to visit all the aircraft engine works, many executives and research engineers were interrogated by the Mission which I took to Germany on behalf of the Ministry of Aircraft Production, and we were able to inspect a sufficient array of engines and components to form a picture of the state of piston-engine progress and the prospects of future developments.

It is a striking fact that the in-line or vee-type liquid-cooled engine, and the air-cooled radial, have proved to be the classic types on which two major air wars have been fought, with the exception that since 1918 designers have found how to make the radial cylinder arrangement work without whirling the whole engine round about its crankshaft. The British, American, U.S.S.R., German and Japanese air forces all relied on these basic types for the war just ended, and the British Sabre stands out as the only breakaway to see considerable front-line operational service at high powers.

Of the main German engine companies working on aircraft power plants, Daimler-Benz, Junkers, and B.M.W. remained by far the most important, and continued their piston-engine development throughout the war, supplying between them all the first-line fighter and bomber engines of the German air force. As has been the case in other countries, there was nothing of particular interest to report on the lower-power training engines. Hirth linked up with Heinkel on jet engine development, and Argus turned from their small inverted vee engines and devoted their development capacity to work on the V1 propulsive-duct engine and its derivatives.

Severing the Arteries

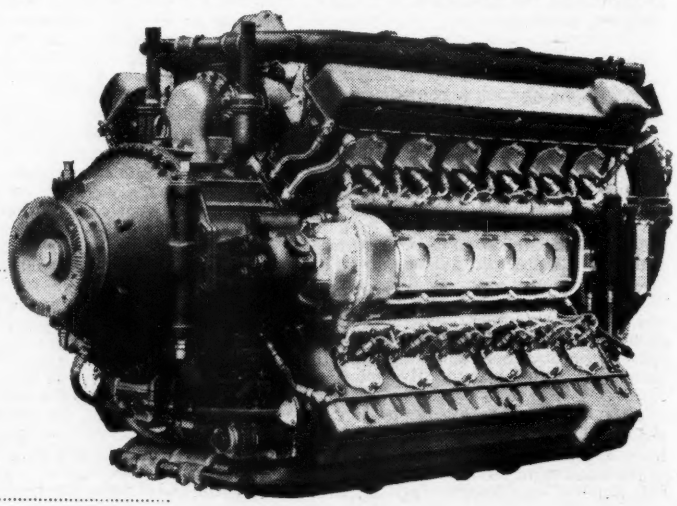
The three main engine firms, Daimler-Benz, Junkers and B.M.W., at the height of their production, employed between them 150,000 to 170,000 workpeople, and were turning out, with the help of the shadow firms, something of the order of 5,000-6,000 engines per month. The Allied bombing, however, which became most effective during the last few months of the war, reduced this output to about a third. Most people commented on the efficiency of our communications bombing, which, they said, was far more disastrous from an engine output point of view than was actual bombing of works. Few works could not be repaired, or dispersed in a comparatively short time; but the bombing of railheads, trains, lorries, bridges and roads absolutely paralysed supply and production. Dispersal, to be effective, must be complete and self-contained. A big chain of bomb-proof underground factories was being built up when the war ended, but they were earmarked almost entirely for jet and rocket-unit production.

At the beginning of the war Daimler-Benz had the most advanced engine in the D.B.600 inverted vee-12 liquid-cooled series, and development on this type proceeded steadily, though not brilliantly, throughout the war. This company did not seem to have been so consistently successful as in the previous war, and it is said they have been in continual difficulties, both political and technical. Nevertheless, their chief engineer stated that, had the war continued, 2,900 h.p. would have been obtained from their largest 12-cylinder engine, the 605, in series production during 1946.

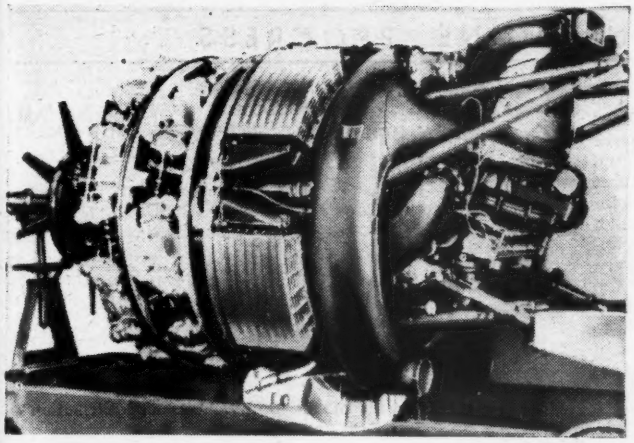
Already a new cylinder head and new supercharger had been developed to give 2,800 to 2,900 h.p. on the experimental 603N engine. This unit had a two-stage two-speed supercharger with the D.B. hydraulic clutch and freewheel, and obviously reflected the great German interest in the Merlin 61 series, though no intercoolers were used. It is also interesting to note that the roller-bearing big-ends, a special and finnicky feature of the early D.B.600 series, were replaced by plain lead-bronze for the higher powers.

Best Production Type

It would seem that, towards the end of the war, the Junkers 213 inverted vee-12 liquid-cooled type, rated at 2,200 h.p., was probably the best fighter piston-engine that Germany possessed. The B.M.W. 801, a successful 14-cylinder air-cooled radial, which was not in actual production at the beginning of the war, had been the subject of a special "urge" by the R.L.M. under the direction of Herr Sachse, who not only developed the B.M.W. 801 engine itself, but also arranged for the complete power plant trials in the Hermann Goering wind tunnel at the L.F.A., the great research establishment at Völkenrode, near Brunswick. He also developed and later made (in a factory of his own, after leaving B.M.W.) the special single-lever control for this engine combination, which is undoubtedly



The D.B. 604 was a 24-cylinder "X" type engine intended to produce 3,500 h.p. from 43 litres. It suffered severe teething troubles, and development work was stopped in 1940.



The B.M.W. 801-I (sometimes known as 801 T.J) was a turbo-blower version of the 14-cylinder air-cooled 801 radial. "The whole exhaust turbine design looked very promising," says the author of this article

a very fine piece of work; it has been fully described and illustrated by the R.A.E.

German technicians felt that considerable improvement could still be made in the drag of piston-engine installations, both liquid and air-cooled. This, however, was only possible with suitable equipment and long, full-scale wind tunnel exploration, such as that executed at Volkenrode, which had already paid good dividends. The B.M.W. 801 fan-cooled installations in the Fw 190 and Dornier 217 E.2 bomber have been widely studied as examples of thorough and ingenious baffling and cowling for air-cooled radial engines; but the Germans believed that a further reduction in drag to the extent of 150 to 200 h.p. was still possible in the Fw 190 installation with the B.M.W. 801 engine, and this work was actually in hand when Germany collapsed.

In an effort to evolve power plants of the order of 3,500 to 4,000 h.p. in the shortest possible time, a good deal of effort was, early in the war, put into developing coupled versions of the Daimler-Benz inverted vee-12 series such as the D.B. 606, 610 and 613. These coupled types are found with left- or right-hand rotation, but were not successful in practice. Contrary to reports, the Daimler-Benz engineers claimed to have developed the gearing to a state where it gave no trouble, but the whole power plant was so congested and badly executed that trouble with fires had been almost insuperable. It will be recalled that these coupled engines appeared on the early version of the Heinkel 177.

Cylinder Multiplicity

It was apparent that no permanent solution was to be found along these lines, and all three major engine constructors had been working on new types, breaking away from the inverted vee-12 liquid-cooled and 14-cylinder air-cooled radial formulæ. Among the many projects put in hand by Daimler-Benz was the D.B. 604, a 43-litre "X" engine of 24 cylinders, probably intended to produce about 3,500 h.p. The bearings and con.-rods gave trouble, and work was stopped in 1940 by the German Air Ministry. There have also been reports of a D.B. 630, with six blocks of six cylinders and the immense swept volume of 89 litres, giving initially about 4,000 h.p.; but the Daimler-Benz works had been very thoroughly combed by various Allied interests, and we saw nothing of this particular project.

The Junkers contribution to the high-power class was the Jumo 222, a 24-cylinder liquid-cooled engine of about 80 litres capacity with six banks of four cylinders radially disposed. This engine showed promise—although there were various connecting-rod troubles—but work on it had been virtually at a standstill for some months before the end of the war, as all the development capacity available for piston-engine work (and this was severely limited) was concentrated on the 213 series.

We made a short visit to the various Junkers engine works in the vicinity of Dessau, but damage there was so extensive that little of value could be seen in the quick look round which was all that was possible with the imminent approach of the Russians. Dr. Scheibe, in charge of Jumo piston-engine development, said that out of a large number of Jumo 213 projects, three definite series had crystallised, viz.:—

213A	....	1 stage 2 speed supercharger.
213E	....	2 stage 3 speed supercharger.
213J	....	2 stage 3 speed, but with a different gear ratio, and having 4 valves per cylinder.

The 213J was the latest mark scheduled for production. The weight with intercooler was 2,325 lb., and the power 2,350 h.p. for take-off on 87-octane fuel at 3,700 r.p.m. They seemed hopeful of quickly obtaining a production rating of 2,600 h.p. from the 213, and appeared willing to accept an abnormally high piston speed and high r.p.m.

Herr B. Bruckman, for many years at Siemens Spandau on air-cooled radial engines, was chief engineer and technical director of all B.M.W. piston and jet engines at the time of the collapse of Germany. He will be remembered as having made a tour of the British engine firms shortly before the war.

In the course of several days at B.M.W., Munich, a considerable amount of information was obtained on their piston-engine development. The main activities had been: (a) to develop the 14-cylinder air-cooled radial 801 up to the limit; (b) to design and make prototypes of the 18-cylinder 802 engine, a double-bank, air-cooled development of the 801; and (c) to develop the 28-cylinder 803 engine, a large 4-bank liquid-cooled radial.

Developments of the 801

The latest production mark of the 801 series was the 801E, which had a very fine pressure-die-cast cylinder-head, chromium-plated cylinder barrels and exhaust valves, and stronger pistons with very thick heads devoid of all ribs.

The 801F incorporated a strengthened crankshaft, which was necessary for powers in excess of 2,000 b.h.p. It was expected that this engine would be rated in production at 2,200 b.h.p. and 2,600 b.h.p. with methanol/water injection.

The 801-I was the turbo-blower version. The turbo blower was made by B.M.W. themselves, and mounted rather high up behind the engine, with its axis sloping forward about 30 deg. from the vertical. Quite a number of these had been made, and about a dozen were subsequently seen on engine stands lying out in the open on Kassel airfield. The turbine wheel employs hollow steel blades, similar in conception to those in the German jet engines, and the whole exhaust turbine design looked very promising, and in advance of any known American type.

The 802 was an 18-cylinder engine of interesting and unorthodox design, and was the product of the Munich parent firm before the Siemens amalgamation influence had become predominant. The basic design was attributed to Dr. Sachse. Several of these engines were made in 1942, but development in the last few years had been dropped in favour of the 801. Dr. Amman, the engineer in charge of piston-engine development, thought the 802 was a good engine, and felt that if more power was to be the goal, then they would have done better to have switched over to the 802 rather than to flog the 801, which was now about pushed to the limit. He thought that 3,000 b.h.p. would have been obtained fairly easily from the 802; this seemed a reasonable anticipation.

The bore and stroke were 6.14in. × 6.85in., giving a capacity of 58 litres. The weight was 3,380lb. A two-stage three-speed blower gave a rated altitude of 32,000ft., and the maximum engine speed was 2,700 r.p.m. The cooling fan was geared up to 1.85 times crankshaft speed.

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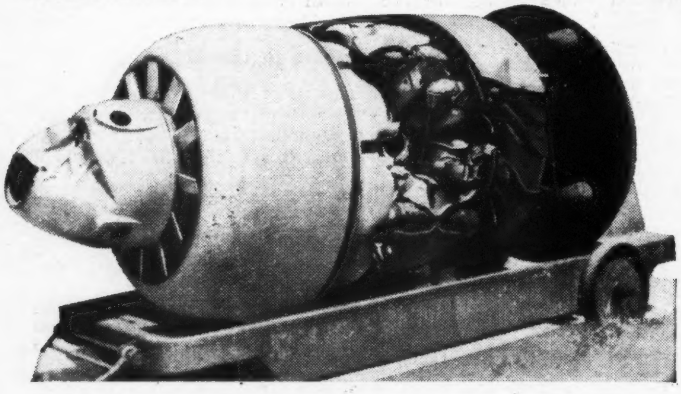
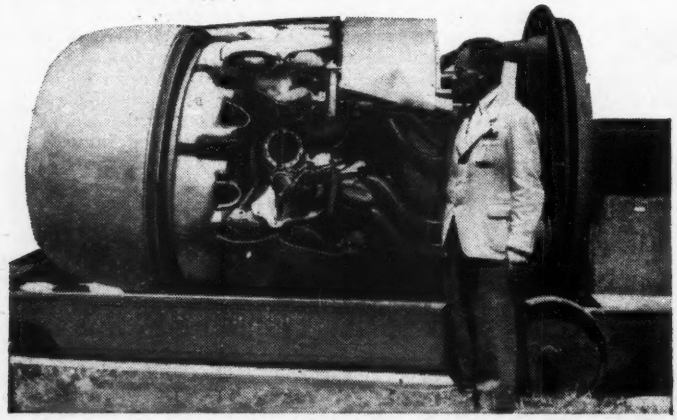
A diagrammatic layout of the B.M.W. 802 is shown in the accompanying drawing. The whole of the air used by the power plant is compressed by the fan and stator ring. The intake air is then taken off by the blower and dealt with separately. The remaining air divides into three parts, (a) through nine intercooler boxes, (b) through front-row cylinder baffles, and (c) through rear-row cylinder baffles. These three streams rejoin behind the rear cylinders, and are finally "ejected" by the exhaust gases. The intercooler air is taken in a thin annular ring over the top of the cylinders, thus slightly increasing the power plant diameter. Under existing design conditions, the aim is to leave the resulting effluent gas stream stationary in space, i.e., ejector thrust + mechanical work to fan just balances the total internal aerodynamic drag of the power plant.

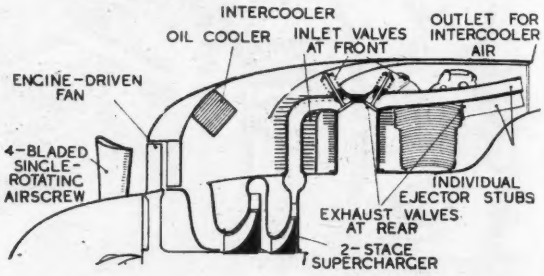
Exhaust-valve Timing Control

Emphasis was laid by the B.M.W. engineers on the importance in this engine of good design and manufacture of the complete power plant, with clean airflow passages throughout. The unorthodox front and rear valve position was intended to help, by giving the shortest and straightest possible air and exhaust passages; and the positioning of the blower on the front, which had been the cause of some mechanical complication, was adopted for the same reason. In addition, it was proposed to incorporate a control for varying the exhaust-valve timing, which would be facilitated by this arrangement. One feels that this was among the most noteworthy engines existing in Germany at the time of her fall, although no one else seemed to be taking much interest in it.





Two views of a damaged mock-up of the 18-cylinder B.M.W. 802 air-cooled radial. Standing alongside is Dr. Amman, engineer in charge of piston-engine development at B.M.W.



Diagrammatic layout of the B.M.W. 802 air distribution system.

The B.M.W. 803 was a project sponsored by the Siemens part of the organisation in Berlin, and not looked upon as very promising by the Munich designers. It was designed by Dr. Spiegel. Though projected some years ago, it was still only in the very early stages of development. A duplex liquid-cooled radial, it consists of two 14-cylinder units originally designed to run independently but co-axially. The idea was that one unit could be cut out if required, but it was found that the bearings of the idling engine rapidly broke up under these conditions.

The two coupled units drive co-axial airscrews on the front end, and two-stage two-speed blowers side by side at the back.

Each 14-cylinder unit consists of seven radially disposed, twin, in-line, liquid-cooled cylinders, as shown in the illustrations. These cylinder units are detachable, complete with barrels and valve gear. There are two valves per cylinder operated by an overhead camshaft, each driven by a bevel geared radial shaft.

The bore and stroke are 6.14in. x 6.14in., making 83.6 litres capacity for the whole 28 cylinders. An output of 3,700 b.h.p. was anticipated for take-off at 2,700 r.p.m. The weight of the prototype was 7,714 lb. complete with airscrews, but this was rather more heavily built than would be the production version. About twelve had been made, and some were seen in pieces at Munich, but no serious work had been done on them since August, 1944.

Indifferent Design

An alternative type of head has been tried, using a flat-plate rotary valve instead of the normal valve gear, with the head above the rotary valve finned for air cooling. This gear looks springy, would seem to be difficult to lubricate, and appeared a poor job.

Another feature of this engine is the use of forked articulated connecting rods.

In general the whole layout and design appeared clumsy and rather indifferent, and gave the impression of having been designed by someone with an "air-cooled radial" mentality, yet without the courage of his convictions.

Once the search for greater power had forced designers away from the well-proved basic types, the in-line and the radial exponents had drawn more closely together; Jumo, for example, adopted six radial banks of four cylinders, while B.M.W. worked on what was, in effect, seven radial banks of four cylinders.

Generally speaking, the best that the German industry could offer the *Luftwaffe* by the time of the collapse were the 12-cylinder in-

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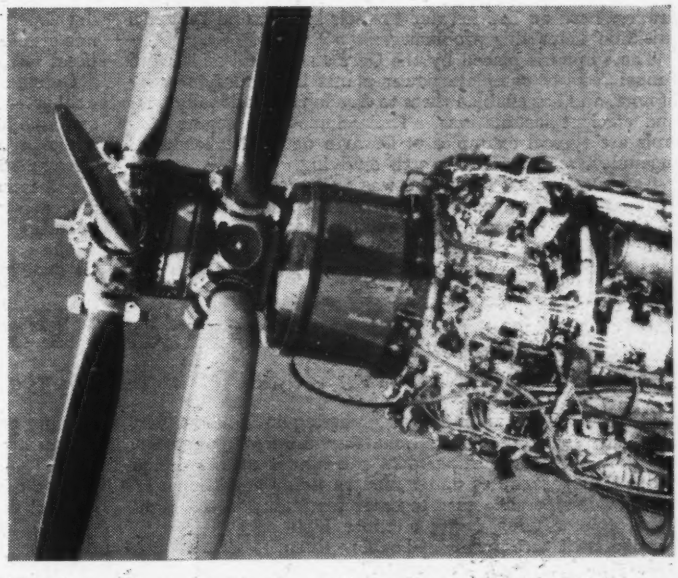
verted liquid-cooled in-line and the 14-cylinder air-cooled radial series ranging in power between 2,000 and 2,400 h.p.

They had a number of other developments, but, as has happened in other countries, they had found the development of high-power piston engines very slow and difficult. Moreover, they were handicapped by a number of bad technical decisions from the German Air Ministry, and a policy of stopping and restarting certain developments. In the last stages of the war the greater part of their research facilities and development capacity were reserved for jet and rocket units. Furthermore, development was being harassed all the time in continually increasing measure by our bombing.

From the most reliable opinions it was gleaned that under war conditions they did not feel that a 5,000 h.p. liquid-cooled engine, or a 4,000 h.p. air-cooled type, could have been got into series production in less than four years. It was suggested that the solution for the former would probably have been found on the lines of either the Jumo 222 or the B.M.W. 803, although to us the latter seemed to be an indifferent effort, which was unlikely ever to become a classic type.

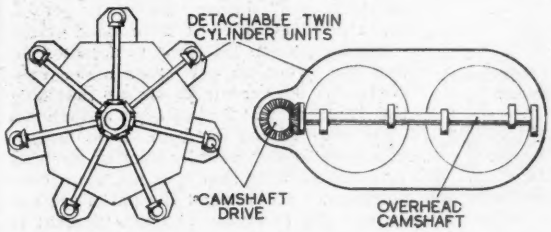


The B.M.W. 803 consisted of two liquid-cooled 14-cylinder units driving co-axial airscrews.

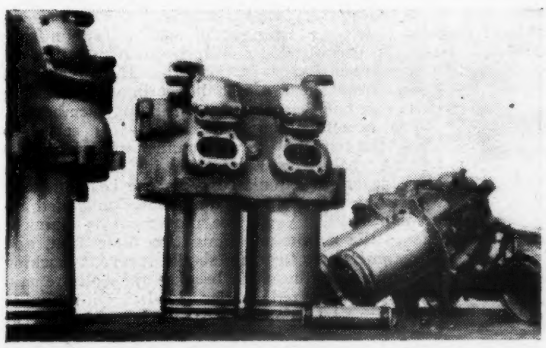
Little to Learn

Looking at the excellent record of steady development and the increasing powers obtained from our own piston engines throughout the war, one cannot feel that there is a great deal to learn from Germany about the piston aero engine. As in the previous war, they tended to use larger swept volumes than ourselves, and the British designers remain the world's masters at obtaining high power from a given cylinder capacity.

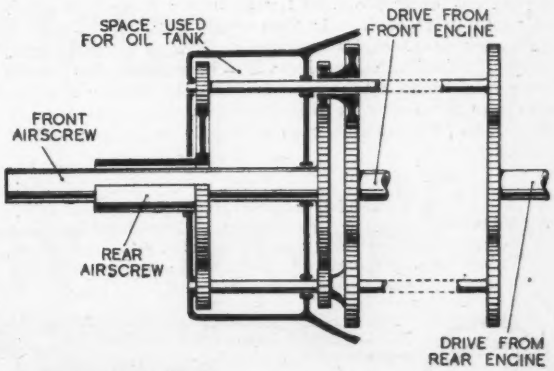
Our whole supercharger technique was certainly in advance of that achieved by the Germans. Their developments in this direction were, no doubt, impeded by the limitations of the fuels available to them. They had to fight the war mainly on supplies of 87-octane for liquid-cooled engines, and 92-octane for air-cooled types. Their bold decision, before the war began, to concentrate on direct fuel injection undoubtedly helped them considerably in getting the best out of the fuel available, and it yielded increasing dividends as the number and size of cylinders were increased. When one considers the troubles that are liable to arise through the problems of reliability and maintenance under operational conditions, owing to the trapping of fuel in inverted cylinders, it is probably true to say that the Germans could not have made successful large-scale use of their basic inverted V.12 types without injection equipment. Some of our party formed the opinion that German aero engineers were less ignition-conscious than we are. This may be no derogatory criticism of our ignition equipment, but rather that German engines



Layout of valve gear in a single section of the B.M.W. 803, showing the arrangement of the camshaft drives.



Cylinder assemblies of the B.M.W. 803, with overhead camshaft gear.



In the B.M.W. 803 the drive for the co-axial airscrews was taken from the rear unit through the point unit by five longitudinal shafts in the inter-cylinder spaces. The remaining two spaces were used for other purposes.

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are less hard on ignition due to their layout, and that fuel injection helps this problem.

The emphasis placed by the Germans on full-scale wind tunnel tests of complete power plants is certainly worthy of note, and has enabled them to develop exceptionally neat and efficient installations. Their single-lever engine controls are typical examples of German detailed mechanical ingenuity, and are well worth studying.

German foundry technique was exceptionally good; the Daimler-Benz crankcase and the B.M.W. die-cast cylinder head may be quoted as outstanding examples. Although Krupps patented and did much original pioneer work on nitriding steels, the British Vickers Hykro specification was developed more successfully, and gave us exceptionally fine crankshafts, free from the impurities and defects which beset German constructors.

German steel-makers were hard put to it to keep up quality, and their engine builders had a difficult time in continually having to change specifications owing to shortage of special alloys. By and large, I think the German steel-makers did pretty well under great handicaps. I well remember being duly impressed by seeing a formidable array of fatigue-testing machines at D.V.L. in 1937 operating entirely on low-nickel steels.

The concluding article in this series will review German jet development.

Parachute Problems

Free Drops from 40,000ft. : New Type Irvin Pack for Aircrews

SPEAKING at an informal gathering in London, Mr. Leslie Irvin, the international parachute manufacturer, gave some interesting facts and figures on the design and use of parachutes under modern flying conditions.

The worst possible case to cater for to-day is the high-flying fighter pilot flying a super high-speed aircraft with pressurised cabin. Even if the pilot is flying a jet-propelled aircraft with no airscrews to complicate matters, it is still a physical impossibility for him to get out of the machine, make a jump and manually operate the normal-type canopy. Suppose, however, he were able to get out by his own efforts, he would still die, either from lack of oxygen before the open 'chute had carried him down to a breathable level, or from the great shock loads experienced as the parachute opened.

Humorist's vision of "clockwork device and barometer"

The Germans already have a device for slowing the rate of opening of a parachute, and it is interesting in this connection to note that, contrary to expectation, shock loads experienced in the rare air of great heights are much more formidable than those normally felt at lower altitudes. The problem is being solved by the employment of pilot ejector devices, and Irvings have a parachute which falls free to 10,000ft. It then opens automatically by a clockwork device and a barometer. Falling from 40,000ft. at his terminal velocity of 118 m.p.h. a man takes nearly three minutes to reach 10,000ft., and the sudden ejection into rare air for even this period is likely to be very dangerous. Presumably a small supply of oxygen will be carried.

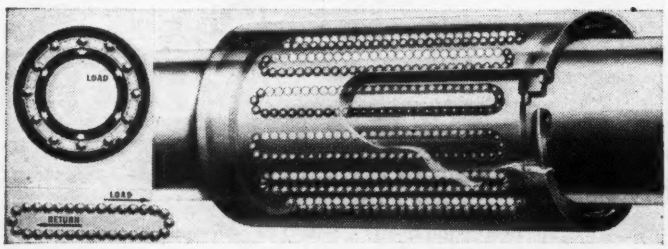
Many people have been puzzled as to why multiple parachutes are used instead of single canopies for dropping heavy objects such as guns, jeeps and tanks. Mr. Irvin pointed out that speed of opening was the governing factor. He had designed and made 'chutes of 90ft. diameter, but these took 8-10 seconds to open as against the 1⅞ seconds of the standard type. Since the drops, for reasons of accuracy of aim, frequently have to be made from as low as 600ft., the delay in opening was too long.

Having heard of little else but the number of deaths from one cause or another during the war years, it is refreshing to know that over the last six years of war more than 30,000 Allied airmen have leaped to safety in Irvin parachutes. This figure represents half of the fatalities sustained in Britain by enemy air attack.

Over 400,000 parachutes have been manufactured during the war period. Sixty per cent. of these were made at the company's own factory at Letchworth, and the other 40 per cent. under sub-contract. The company claims that 99.9 per cent. of all Service-type parachutes used during the war were of 100 per cent. Irvin design. The quick-connector type so long used by bomber aircrews has always had one bad fault in that it is not worn continuously, and emergencies occur when the packs are out of reach. If only one clip is fastened, a safe descent is guaranteed, but in some aircraft it is impossible to have the pack handy. To replace this type a new flexible back-pack, to be known as B-5, is now in production.

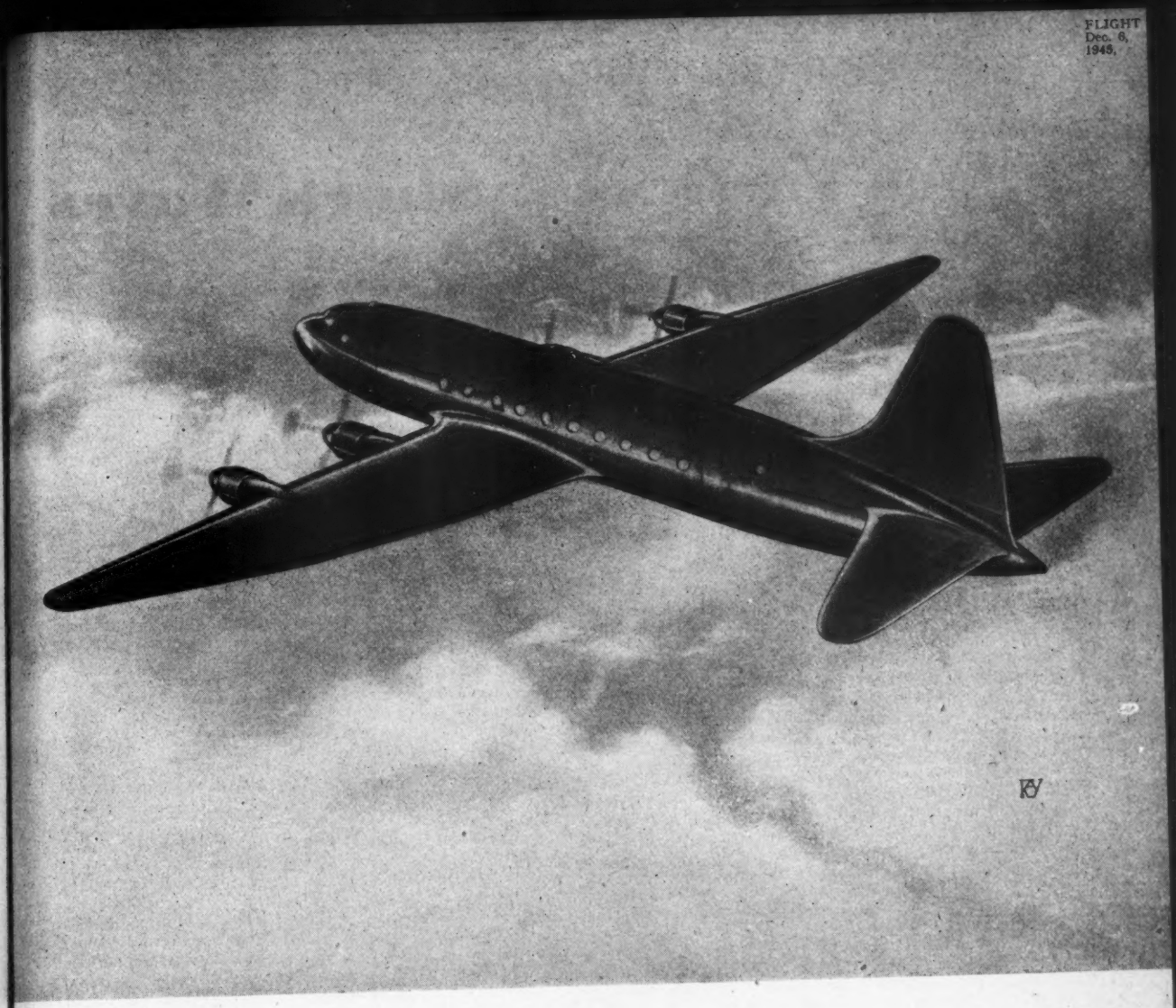
BALL BUSHING

A NEW type bearing for reciprocating members has been developed by the Thriftmaster Products Division of Thomson Industries Incorporated of New York, and is marketed under the trade name of "Ball Bushing." The bearing medium is balls which are arranged in such a fashion that unlimited travel is permitted to reciprocating members of round, square or polygonal cross-section; thus the advantages gained from the use of ball bearings for rotating parts can now be obtained for sliding members.



The "circuit" arrangement of the balls and the oil retention sealing are well shown in this semi-diagrammatic illustration.

The accompanying illustration will serve to show the entirely novel manner in which the bearing balls are arranged in circuits with one side of the circuit carrying the bearing load, whilst the other side accommodates unloaded returning balls. Very free movement is claimed, due to the maximum elimination of friction, and the continuous bearing should prevent cocking or binding on the shaft because the balls remain constantly centred under load. Oil-retaining seals are incorporated at each end of the bearing sleeve, so that the combination of rolling contact plus sealed lubrication results in a long life of precision alignment with negligible friction.



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"Indicator" Discusses Topics of the Day

Shock Tactics for Shock Waves

Starting with a Clean Sheet : Are we on the Right Lines of High-speed Development? : The Strange Case of the Spitfire

THE more one thinks about it the more obvious does it seem that we have a very long way to go in this compressibility business. Some time ago, after bursting into print with a series of casual remarks about the important part which will be played by the experimental test pilot in "getting over the hump" of compressibility, I was shot down by people on both sides of the fence. On one side, the test pilots were hurt because I had dared to suggest that there was anything for them to learn, and, on the other, the technical people leapt on me because I had appeared to underrate their knowledge and the part that this knowledge had played in the development of various very good aircraft.

In those days I was earning my living by flying at varyingly high speeds in an endeavour to put different aircraft into good running order. Since, in the course of some years of such work, I had spent a very great deal of valuable time in trying to get minor technicians to understand what was wrong with any particular aircraft and to make them put it right to my satisfaction before I flew it again, I had reason to be biased in favour of the pilot.

It seemed to me that the only person who could really know what was wrong with a machine when it behaved peculiarly at, say, 470 m.p.h., was the pilot himself, and that the sooner he learnt to translate his knowledge directly into terms which could be appreciated and admired by the technician the better it would be for all of us. And I can still find no very good reason for any modification of that view when stated in general terms, though I am leaning more and more to the opinion that, if we ever are to get over the "hump" successfully, everybody will have to throw away most of his old ideas and start again at the beginning.

Surely there is something very odd about it all when a five-year-old design can, without much difficulty, be modified to fly safely at high Mach numbers than designs with special anti-shock-wave features, and when an even older design still has the reputation of being under decent control at the prodigiously high number of 0.92.

High-speed Bumps

I don't suggest that the record-breaking Meteor, in its high-speed form, would be very useful as a combat type, but it is obvious that the general shape is a good one and it might only be necessary to redesign the control system to make it comfortably handleable at speeds of the 500-600 m.p.h. order. Nor do I suggest that such speeds are really going to be of much value in combat flying, since bumpy conditions, near ground-level or in cloud, are shattering both to the pilot's spine and to the structure.

And I can hardly imagine that the Spitfire, which is reputed to have been dived under control at 620 m.p.h. at 30,000ft., was capable of being moved rapidly from its flight path at that high Mach number—though the A.S.I. reading would only have been in the region of 400 m.p.h. and the control loads would consequently have been only moderately high.

Though I have not seen any recent semi-official list of maximum safe Mach numbers for different types, it would appear that the Spitfire still heads the world's list, with the modified Meteor probably coming along second and the Lockheed P.80 Shooting Star third or at least fairly well up among the best ones. Knowing the differences that minor variations in shape can make to the handling qualities of fast aircraft, it is quite possible that individual examples of each make would have varying higher or lower safe Mach numbers, and that it is impossible to list the "good" types with any real accuracy.

Even so, the fact that the Shooting Star does not appear actually to top the list makes one feel doubtful about the value of the aerodynamic knowledge which is so far available. Since this aircraft was designed with the help of ample experience for the express purpose of flying at very high speeds and is, so to speak, all laminar flow and sharp leading-edges, it should be points ahead of the Spitfire and the Meteor. Maybe, when the designers and test pilots have finished with the P.80, its safe speed will be very much higher than we imagine. But so far we can all sympathise with the designer who doesn't believe in laminar flow or any of these "new-fangled ideas."

In order that there should be no misunderstanding, perhaps I should stress the fact that I am discussing terminal speeds in relation to handling characteristics, and am not making invidious comparisons between different aircraft in the plain matter of level maximums. That would be quite another matter—though our old friend the man-in-the-street may now have all the wrong ideas and may even have forgotten that two jet units naturally give more thrust than one.

Alleviate or Cure ?

Certainly, viewing the whole thing as a complete and only semi-technical onlooker, I find it difficult to believe that we shall get very far merely by ingenious alterations to wing-sections and by the modification of present layouts. At the best, we can only delay the arrival of shock-wave effects and then, with the aid of patent recovery flaps and all the rest of it, try to make the aircraft controllable while the Mach number is being reduced to a safer level.

The entire situation is fraught with interesting problems. Even when we have found a wing-section which functions satisfactorily at very high speeds we still have to design controls which will continue to work and which will not be either too heavy or suffer from incipient over-balance and other troubles. Perhaps the power-servo is the answer to that, but we shall have to make the skin, both of control surfaces and structure, so very stiff that it will not distort under the loads imposed and thus spoil the whole thing.

In the bad old days of not so very long ago the most extraordinary things used to happen to lateral trim even at comparatively moderate speeds. The skin would begin to "pant" somewhere or other, the shape of the wing or the control surface would be consequently altered, and nobody could possibly, thereafter, follow the ramifications of the airflow. And all that happened well before the incidence of any of this shock-wave business. Plain variations of air pressure altered shapes to such a marked extent that the aircraft might suddenly start to roll one way or the other and could hardly be held until speed had been reduced. In some cases it was safer just to let the aircraft roll while losing speed.

Then we had ailerons rising up to look at us, so that, unless we watched for the signs early, they pulled the cables until they either broke or stretched so much that over-balance occurred and everything was liable to come off with a bang. Or maybe the rudder would start to weave about and it was necessary to cord it heavily on each side of the trailing edge in order to keep it still. We have got over many of these difficulties, but we have by no means yet finished with all of them.

Then the jet aircraft have a private problem of their own. Where can the air intake be arranged? With two-and-a-half tons or more of air needed every minute to feed the jet, a very big hole has to be arranged somewhere. All is fairly well in multi-unit types, because they can have

their separate nacelle entries well away from the fuselage and well ahead of the leading edge. But the difficulty is a very real one when we are dealing with single-unit aircraft. Put the intakes on either side of the centre-section and down goes the Mach number unless you're very clever indeed in arranging from the air to spill over the intake lips. Put them in the fuselage and well away from the wing and there are still likely to be disturbances over the tail surfaces. Put the intake in the nose and there is the difficulty of providing good, straight, streamline passages past the cockpit to the unit.

The time has come, I feel, for us all to admit humbly that we don't really know what is going to happen, and to realise that until we have obtained some more practical data from a lot of very courageous pilots it will all be much a matter of trial and error. So far, all jet aircraft that have been seen in the air have been, in the words of Dr. Roxbee-Cox, merely "aircraft with invisible airscrews." They're just like any others.

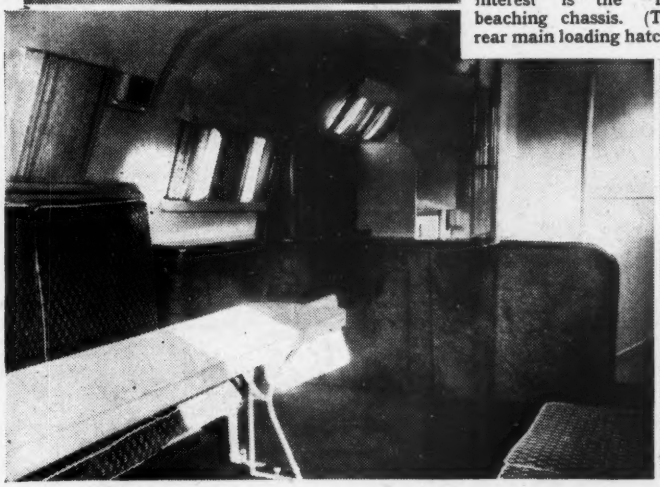
If we want to go really fast and to make use of all this new propulsion urge which the engine manufacturers are now giving to the designers, it would seem that the latter will have to start again with nice clean sheets of paper, new slide-rules and sharp pencils. Something very queer indeed may appear on the clean sheet of paper—with even queerer things to follow. And even then it is difficult to see how the "hump" can ever be scaled without the aid of atomic energy to take us over the last and vertical section. If only the Wright Brothers had known what they were letting us in for!

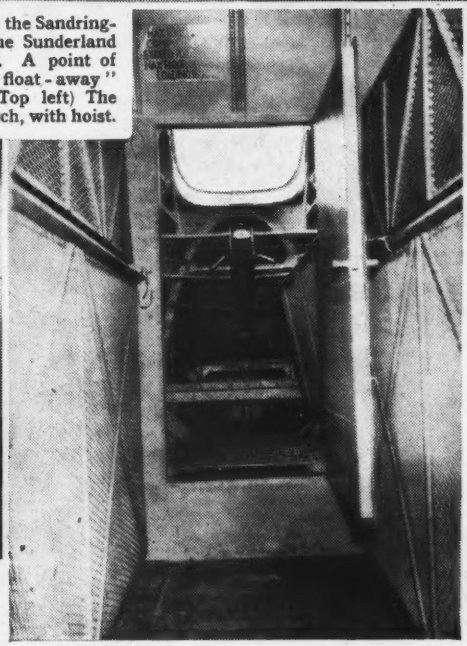
Tailpiece:—A long time ago, following a learned discourse by Dr. Bairstow on probable sonic effects, the German experts, I am told, always spoke about "Bairstow Numbers." We, with our customary admiration for the work of others, preferred to attach the name of Dr. Ernst Mach, a German aerodynamic expect, to the mystic ratio which is now of such profound interest to the more earnest citizen.

Short Sandringham

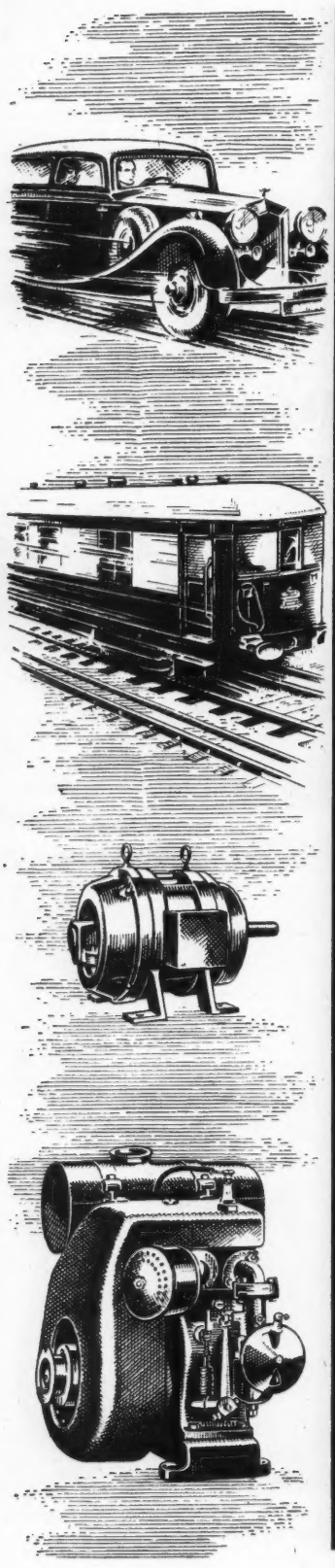
Civil Sunderlands Now in Production

Externally (top right) the Sandringham differs from the Sunderland mainly in the nose. A point of interest is the "float-away" beaching chassis. (Top left) The rear main loading hatch, with hoist.





With a maximum all-up weight of 56,000 lb. the Sandringham (four Bristol Pegasus) carries a 7,600 lb. payload of mail, freight and 24 passengers by day or 16 by night, cruising at 199 m.p.h. (Bottom left) Part of the passenger accommodation, showing the cocktail bar, behind which is seen the pantry. (Bottom right) In the Sandringham the nose turret of the Sunderland has given way to a mooring compartment and hatch. An account of the launching of the first Sandringham appears on page 613.



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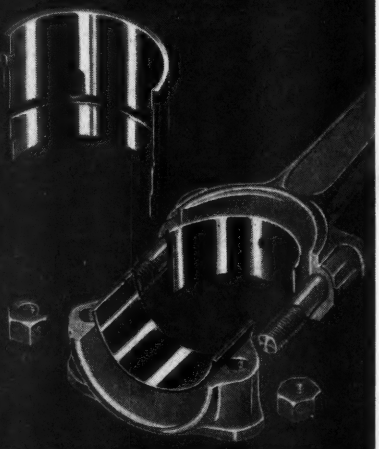

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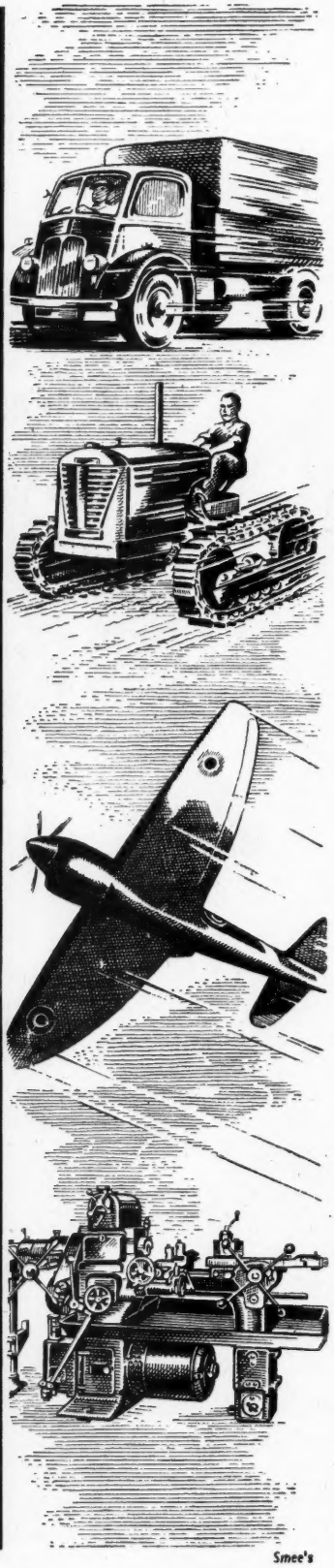


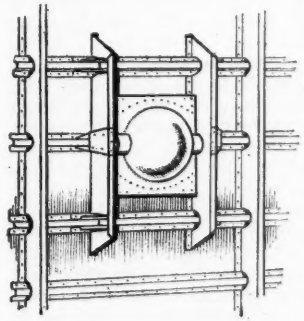
Smee's

The SHETLAND II

Further Details of the Largest British Flying Boat : Ingenious Electrical Assisters for the Flying Controls

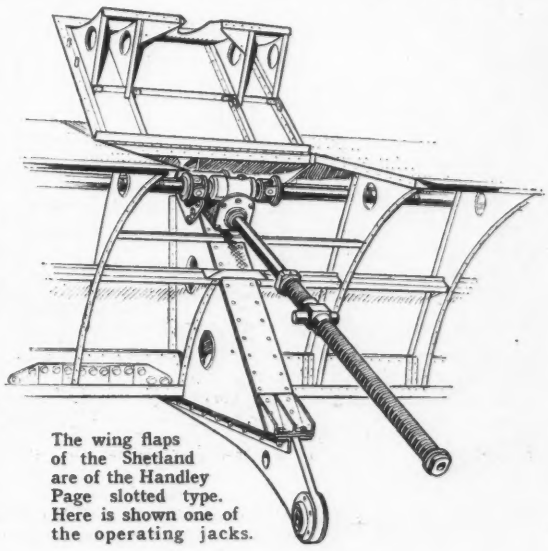
WHETHER or not the very large flying boat is to have a place in future British aviation, military and civil, seems to be a question that has not yet been decided by the powers-that-be. It will be known to our readers that we on this journal believe the flying boat has a place in the scheme of things, especially when we come to the very large sizes of aircraft which will require runways of fantastic length But while the authorities are making up their minds on the subject, it is good to know that work is being done in this country on this type of aircraft. Short Brothers, of Rochester, have one such large boat, of military type, the Shetland, now undergoing handling trials at the Marine Aircraft Experimental Establishment at Felixstowe, while another is fairly far advanced at the Short works and is designed for civil operation.

It is very much to be hoped that history will not repeat itself and that work on this second boat will not be stopped in the way that a most interesting large Supermarine flying boat was stopped after the last war. But even at the worst, we shall be better off than we were then and shall at least have the satisfaction that one boat has been completed and thoroughly tested. And here it may be mentioned that the Felixstowe trials, so far as they have progressed up to the present, have given very good results indeed. The water performance is good, in fact probably the best of any Short flying boat up to the Shetland. That others to follow may be even better is quite possible, and the designers are improving various features all the time as more and more experience is gained.



One of the mooring line attachments in the hull.

A very full description of the Shetland was published in our issue of May 17th, 1945, but certain further information has now become available and this is presented herewith. It may be recalled that the Shetland is unique in that it is the result of co-operation between two flying-boat

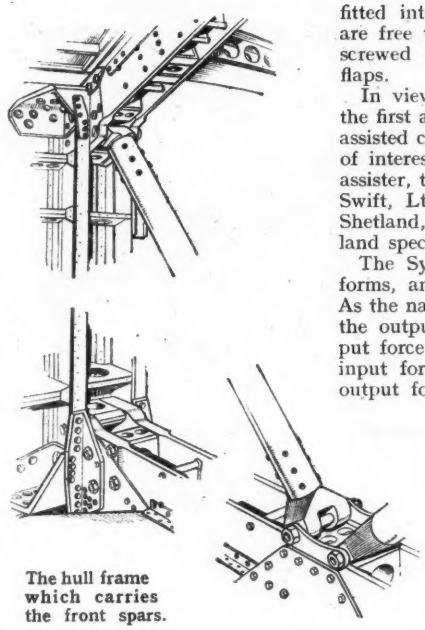


The wing flaps of the Shetland are of the Handley Page slotted type. Here is shown one of the operating jacks.

THE SHETLAND II

concerns. While Short Brothers did the general design and the whole of the hull, Saunders-Roe undertook the design of the wing details. By this division of the design work a good deal of time was saved.

Structurally the Shetland wing is unusual in that it is of the single-spar type, or possibly it should be described as a three-spar construction. A very substantial main spar does most of the work, the other two being more or less auxiliary. This arrangement was necessitated by the fact that large bombs had to be carried inside the wings, and there would not have been room for them between the spars of an orthodox two-spar wing structure. The main spar is of box-girder form, with twin light-alloy web plates riveted to dual top and bottom boom angles. There is no centre section, or rather the centre section is incorporated in the hull structure, and the main spars of port and starboard wings are attached to the hull sides.



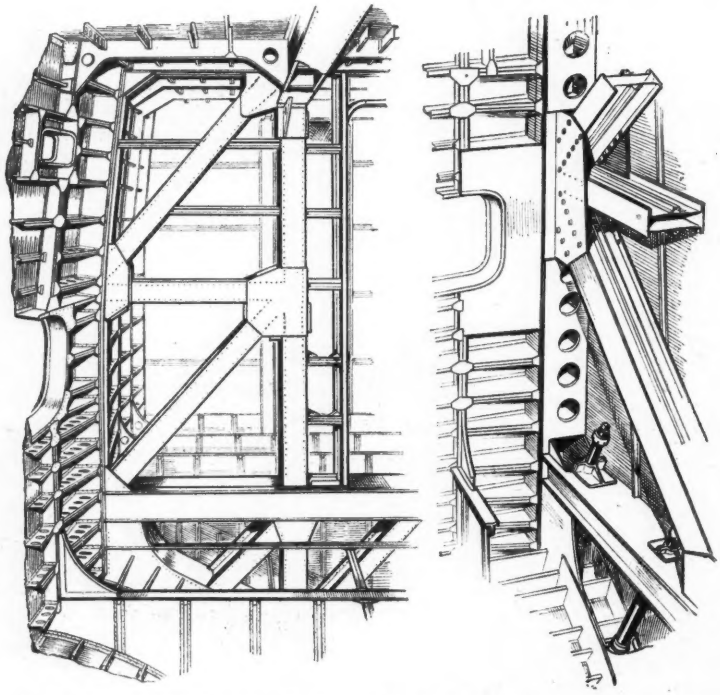
The hull frame which carries the front spars.

The ailerons are of the Frise type, and are of metal construction with fabric covering, but forward of the spar, under the fabric, the leading edge is reinforced with light alloy plating. The wing flaps are of the Handley Page slotted type and of all-metal construction. They are operated by means of an electric motor mounted in the hull. Driven from the motor is a gear box from which are led two shafts, one to port and one to starboard. At the outboard ends of the shafts gear boxes are fitted which transmit the motion to square-threaded screwed rods. These rods are fitted into internally threaded nuts which are free to move axially. Rotation of the screwed rods within the nuts moves the flaps.

In view of the fact that the Shetland is the first aircraft to be fitted with electrically assisted controls, a brief description may be of interest. Known as the "Synchromo" assister, the unit is the product of B. and P. Swift, Ltd. Before being installed in the Shetland, the unit was tested in a Sunderland specially adapted for the purpose.

The Synchromo assister is made in two forms, an irreversible and a "feel" type. As the names imply, in the irreversible type the output force is independent of the input force, whereas in the "feel" type the input force is directly proportional to the output force. Obviously the "feel" type cannot be fully irreversible, but tests have shown that the assister has a powerful damping effect and that, to all intents and purposes, it will eliminate flutter risks. On the Shetland the Synchromo controls for the throttles are of the irreversible type, while those for rudder and ailerons are of the "feel" type.

The assister forms a link in the push-pull control run into which it is fitted with practically no alteration. The input rack and output racks are connected by a pin, and an oversize pin hole permits a slight movement (approximately 50 "thou") between the two racks. With the current disconnected and the two racks forming an integral part of the push-pull control, the flying controls can be operated as ordinary flying controls. When the current is switched on, power is transmitted from the input rack to the electrical positional servo unit controlled by the contact mechanism and thence to the output rack.



Hull frame in way of rear wing spar. On the right the lower portion of the front spar frame. Also shown are the locking pins for the beaching gear.

"Gear" Contacts

Perhaps the most ingenious feature of the Synchromo unit is the contact mechanism. This includes four geared contact wheels made of a special material of high conductivity. These gears do not transmit power but serve as electrical contacts only. By making these contacts in the form of gears, they are not influenced by acceleration, nor, of course, are there any springs which might fatigue. Furthermore, the gear-type contact offers an almost infinite number of contact points as against the single-point contact in ordinary relays. Extensive tests carried out at low temperatures and in air of low density have shown that the contacts will stand up to hundreds of thousands of movements without appreciable wear.

The "feel" device comprises a differential mechanism, the centre shaft of which is geared to the input rack, the differential housing to the output rack, and an outer gear to the electric motor. The ratio of input force to output force is governed by the leverage of the differential mechanism, which is so arranged that the ratio can be altered without much difficulty. A normal ratio is 1 : 6, that is to say, the pilot feels one-sixth of the total output force. On the Shetland the maximum output force of the Synchromo unit is 500 lb., which corresponds to an input force of about 80 lb. The pull-push rod an be moved over its full travel of 11 inches in not more than one second.

Anglo-American Angle

An Englishman in the States Reports Transatlantic Reactions to the Meteor Record, British Publicity Methods and Other Current Topics

By "KIBITZER"

THOSE of us in America who have British aviation at heart were under a severe strain during the weeks leading up to the Meteor record. Why on earth it was necessary, so long beforehand, to reveal that an attempt was to be made on the world's speed record is a complete mystery. It showed a lamentable lack of publicity sense and values, besides serving to underscore what is often so painfully obvious over here—that the average Britisher hasn't the remotest appreciation of the American outlook in this British-versus-American aircraft controversy.

As a result of these premature announcements, American manufacturers, quite understandably, were quick to discount the attempt in advance. An obviously inspired article that appeared the day before the successful attempt, and which was published in the *New York Times*, announced:—

> "Neither Bell nor other plane manufacturers here were especially concerned over the record attempt except for the use British manufacturers might make of it as sales propaganda for British planes abroad. They point out that according to the message received by NAA, the Meteor was stripped of arms and armament and had 'souped-up' engines. A Bell representative said it was probable the plane also carried just enough fuel for the record try. Under these non-combat conditions about ninety miles an hour would be added to the plane's speed he believed."

Admittedly this smacks of sour grapes, and although the next paragraph lauded the Bell XP-83 as "one of the heaviest fighters ever built, weighing 27,000 pounds loaded" (scarcely a commendation as a fighter requirement!), the implied stigma on the British machine will stick—as it is meant to—in the minds of the public.

Overlooked

Farther on the same article stated: "Other manufacturers here believe that, despite a possible British official record, the United States already has in the Lockheed P-80 and the new Bell P-83 jet planes at the moment more competent in battle and with infinitely longer range as well as planes capable of still further speed development"—blandly ignoring the fact that the Meteor is the only Allied jet fighter to see operational service. If the past history of British information in the States is any guide, one's hopes that additional, and corrected, facts will be fed to, and published in, the American Press seem slender.

Considering all this premature publicity, however, the space devoted to the record when it was finally made was pretty good, and it does appear that, on the whole, British prestige has received a much-needed fillip.

* * *

The words "much needed fillip" may sound strange to readers in England, but frankly—and whilst nobody is more ready than the aircraft trade here to give all credit to the magnificent performance put up by the British in the War—the publicity that has been coming over here lately, on what England is going to do with commercial aircraft, has not deceived anybody. The very tangible ghost of American commercial aircraft progress is not likely to be scared by any graveyard whistling, no matter how good the tune in the circumstances.

Everyone in America knows that, however excellent a bomber may be, it can never compete with a commercial aircraft designed as such (and, mark you, not only designed as such, but built as one of a long succession of similar types, with a design, manufacturing and test and development "know-how" that stretches back over many years). The value of this "know-how" cannot be under-rated. It is certainly necessary to boost British types in order to keep some hold on the foreign markets; but this can be overdone, and it is a ball that is apt to bounce back with unpleasant accuracy if thrown too hard. (It might also be played back by a skilful opponent should it fall in a court already occupied by a competitor!)

A lesson that must be learned in England is that if advance publicity for a *good* thing is dangerous over here, how much more harmful is publicity on something which, with the best will in the world, isn't as good as it is cracked up to be. We *have* got good aircraft—many are the best in the world of their type—so let's shout about them, and not about the stop-gap jobs.

Ray of Hope

The full text of the British Government's statement on its civil aviation policy is not available here yet, but the advance notices seem to show a ray of hope. *If* the Government will leave the technical staffs of the three companies alone, and *if* these same technical staffs can be made up of people who really know something about airline operation, and aircraft as such, and *if* an element of competition is allowed—then maybe our civil airlines will not wither on the vine.

Again, from the point of view of an English observer in the States, it is impossible to understand why American aircraft cannot be bought and operated until our own are ready. To talk about British prestige is one thing, but this is a matter, not of prestige, but of life or death as far as British international airlines go. To hades with the spares left-on-your-hands problem (money will be lost anyway); sink pride and get in after the business!

Maybe even now it is too late. By March, 1946, American Airlines Overseas, T.W.A. and Pan American Airlines will be flying the oceans with Constellations (even the D.C.4 will be semi-obsolete).

* * *

The light aircraft market in the States is in what is generally known as "an interesting condition." If all the stories of orders received and deposits paid are correct, the American aircraft trade is about to produce the biggest litter of mixed animals known to the history of man. It is not altogether presumptive to assume that those unfortunate firms who are not as robust as their brothers will find themselves occupying that well-known position which generally results in a starvation diet.

Quoted figures for some of the better known firms give orders as follows: Ercoupe, 10,000; Republic, 4,000; Taylorcraft, 8,000; Swift, 4,000; and Piper, 5,000. If other manufacturers have received equivalent orders, it all adds up to a nice little sum. It will be interesting to see

A "KIBITZER" is reliably reported to be a character who leans over a poker-player's shoulder and offers him advice on how to play his hand. Even allowing for the popular conception that the onlooker sees most of the game, some may feel that the English "Kibitzer" who contributes this commentary from New York is a little unjust to the British aircraft industry, which at the moment has been dealt a very poor hand indeed; but his impressions are honestly gained from close contact in particularly well-informed circles, and are therefore worthy of serious consideration.

Of his remarks on the premature disclosure of the intended world's speed record attempt, it should be said that the leakage was, in fact, accidental, and was not in any way official or inspired.

ANGLO-AMERICAN ANGLE

what happens, but some of the experienced firms are still staying out, anyway for the time being.

* * *

Preliminary details of some of the air races for 1946 and 1947 have appeared in the Press over here. It is intended to hold the National Air Races at Cleveland in the summer of '46, and a Melbourne round-the-world race in 1947. The former will include special events for jet aircraft, and the leading American manufacturers are being canvassed.

To expect individual British manufacturers to divert some of their energies into financing, producing, entering, and finally delivering to the starting-post a competitive aircraft is probably too much—but would a British aircraft trade nominee, or nominees, be an impossibility? From now on we have got to fight hard in a trade war that will know few rules and less mercy, and everything we can do to consolidate our position will not only help us to sell aircraft but, much more important, will help us to retain the respect of competitors.

The Illusionists

How the Radio Counter Measures of No. 100 Group Kept the Enemy Guessing

ONE by one the "top secrets" of the war are being made known to the world at large—Pluto, Fido, Radar, Starfish, and now Radio Counter Measures. This last secret to be disclosed, designated by the Services' traditional reduction to initial capitals as R.C.M., was sprung on the British Press last week at very short notice. This was because there had, apparently, been no particular desire or intention on the part of the British authorities to say anything about it (not just yet, anyhow) but it was discovered that the American papers were to be given the story that same evening and so British newspapermen were hurriedly summoned to a conference at the Ministry of Information in the afternoon. Those are the facts; we forbear to comment here.

When the story of Radar was released it must have been fairly obvious to most people that it was not the whole story, particularly where the R.A.F.'s use of radio devices was concerned. Even last week's release of R.C.M. does not complete the overall picture of how the Allies achieved their total victory, but it does explain a lot that many people may have put down, quite erroneously, to a combination of good luck on our side and bad staff work by the Germans. True, there was some of the latter at all times—notably the lack of real co-operation between the German scientists and their service chiefs—but almost all our "good luck" was the result of skilful planning, the closest collaboration between our scientists and our fighting Services, and the clever application of radio (and other) developments to the daily problems of war.

R.C.M. was first conceived in 1940 as a radio weapon for the defence of this country, because the enemy was using radio as a means of finding and attacking targets in Britain. German navigators were not very highly trained, but with the aid of wireless beams and radio beacons they could be guided to any desired target. Obviously something had to be done about it without delay, and it was the Telecommunications Research Establishment under Dr. R. Cockburn which supplied the answer to this and many subsequent problems.

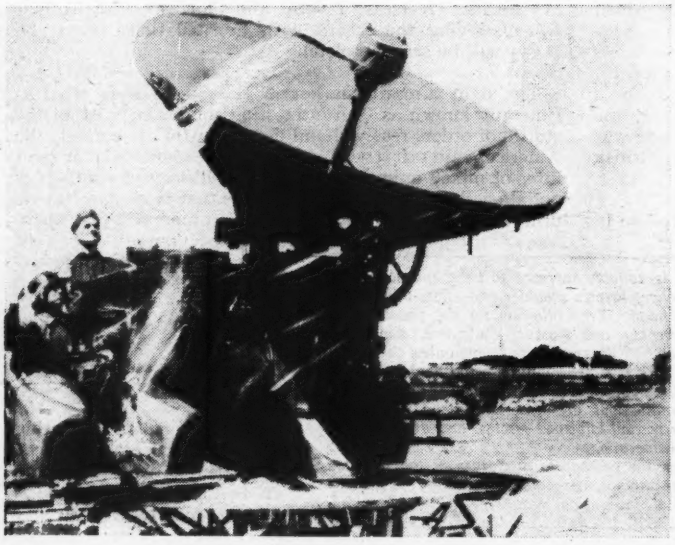
Small Beginnings

Air Vice-Marshal E. B. Addison, who in November, 1943, was appointed A.O.C. No. 100 Group, responsible for handling offensive R.C.M., and who has been A.O.C. No. 60 Group since September of this year, told how, in the early days, the emergency was first met by borrowing radio equipment from hospitals and operating it from local police stations—often in the bedroom of the police-sergeant's wife; such was the humble beginning of the vast organisation known as R.C.M. that ultimately played such a vital part in the defeat of Germany.

Once the necessary apparatus had been devised and produced (a process carried out at astonishing speed and in complete secrecy) the method used to fox the German raiders was quite simple. "We picked up enemy signals and retransmitted them so that they sounded like their own," explained A.V-M. Addison. The unfortunate Jerry pilot was completely confused and when he tried to get a bearing we obligingly gave him one. "I have heard German aircraft over London being told they were over Peterborough; that was the state we got them into," he added.

One night German raiders were heading for the Rolls-Royce works at Derby (we knew their objective, thanks largely to our very efficient Intelligence) and by "bending their beam" they were sent to Nottingham. This sounds a bit grim for poor Nottingham, but by this time the "Starfish" system was being worked and so the attack was drawn off by a nice decoy fire. A following wave of attackers, seeing what they thought to be the Derby target well and truly blazing, turned the requisite number of degrees eastward and flew to where Nottingham should have been—and dropped their bombs harmlessly in open country.

Incidentally, the idea for "Starfish" came when, in an attack on Birmingham, the raiders hit a gas-holder which burned furiously



TIN-FOILED: A captured German radar anti-aircraft fire-control unit being subjected to a test of the efficacy "Window." The foil strips are falling round the unit.

THE ILLUSIONISTS

and enabled the following force to find their target.

A.V-M. Addison said that although it was the R.A.F. which originated and developed R.C.M. and was by far the biggest user of it, the Navy and Army also employed it most effectively. He also paid a special tribute to the W.A.A.F. members of No. 80 Wing which operated the defensive measures, and mentioned in particular Flt. Officer Barbara Pemberton, Flt. Officer Elizabeth Strang, and Flt. Officer Ursula Smith.

When Bomber Command's big offensive against industrial Germany began in 1942, R.C.M. also went on the offensive to disrupt the enemy's flak and night-fighter control. One particularly useful device was contained in a comparatively small box and was carried by some of our aircraft over Germany. This automatically sought for German radio signals and, when it found one, proceeded to jam it. The moment the signal ceased the instrument resumed its searching until it located another.

But jamming was not the only means adopted to save our bomber squadrons from heavy losses. Another tactic was to send out a screen of aircraft from which two, or perhaps three attacking forces would be despatched. At the same time showers of metallised strips—code name "Window"—were dropped to mislead the enemy's radar and thus he knew neither the strength of the approaching squadrons, nor which was the genuine attacking force. This ruse was first introduced in a Hamburg raid when each of the 791 attacking bombers dropped bundles of aluminium foil every minute. Altogether some 20 tons of foil was dropped (in addition to the bombs, of course) and it was estimated that the echoes they produced on the German radar screens informed the Hun that about 1,200 aircraft were attacking. The effect of this, as can be imagined, was nothing short of devastating.

When the enemy resorted to the use of R/T to direct his night-fighters, each of our bombers carried a German-speaking radio operator as an extra member of its crew, and his job was solely to listen for the German frequencies and jam them. Later it was decided to use a "ghost voice" to confuse the German messages.

As an example of how No. 100 Group managed to keep at least one guess ahead of the Germans, it was foreseen by the R.C.M. people that the Germans might suddenly switch to a woman's voice, so they had a German-speaking girl standing by—an English girl who had spent a good deal of her life in Hamburg, and, strangely enough, it was during a raid on Hamburg that the Germans first used a woman controller.

The element of luck, discounted early in this article, was not entirely absent, and one altogether unexpected piece of good fortune helped to solve at least one problem. That was when a Ju 88 pilot landed on an emergency field on the Essex coast under the impression that it was a handy piece of Holland. Not until the pilot had switched off his engines and climbed out, to be faced by R.A.F. uniforms, did he know of his fatal blunder. This Ju 88 night-fighter was equipped with the very latest type of radar interception equipment which had been rather troublesome to us. By a simple error in navigation on the part of a German pilot, the key to the problem had fallen into our hands intact, and within ten days counter measures had been produced by day and night research. The Ju 88 carried the then new SN2 and "Flensburg" equipment, and the counter measure so promptly evolved was a modified form of "Window" which remained a potent factor in neutralising SN2 until the end and thus saving many British bombers and their crews.

Readers will no doubt remember their relieved astonishment when they learnt how the launching of the invasion on the Normandy beaches (Operation "Overlord") had met with no naval or air interception and that the resistance put up on the beaches themselves had been comparatively light.

The man actually responsible for this plan to fox the Germans into thinking the attack was to be elsewhere—between Cap d'Antifer and Boulogne in the Pas de Calais—was Air Comdre. L. Dalton-Morris, Bomber Command's Chief Signals Officer, who worked with a small panel of Service and civilian experts. The hoax was carried out entirely by 105 aircraft of the R.A.F., 34 small ships of the Royal Navy, and R.C.M.

Perfidious Albion ?

Briefly the plan was this. The ships, in two separate groups, slowly steamed towards each extremity of the "fake" invasion area and were backed by aircraft orbiting nearer and nearer the French coast. The ships trailed balloons and the aircraft dropped "Window," and the effect on the enemy radar was to create the impression of a mighty armada slowly approaching over this part of the Channel. The balloons, by the way, produced "big ship" echoes on the German radar.

Our fighters and bombers had put a good deal of the German radar out of business before this fateful night, but to make quite sure of things, another squadron, assisted by four B-17s of the U.S.A.A.F., flew south of Portland Bill and Littlehampton to maintain a permanent jamming barrage. In between the two "armadas" a force of 29 Lancasters patrolled to lure enemy night fighters away from the real landing areas and also carried between them 82 more jamming transmitters. They were also mistaken as top cover for the fake invasion, as it was hoped they would be.

The final touch to the hoax was the dropping of dummy parachutists at two carefully selected points, together with enough "Window" to magnify them into an airborne division 20 times its actual size.

German Aeronautical Progress

MR. W. J. STERN, of the R.T.P. branch of the Ministry of Aircraft Production, who accompanied Sir Roy Fedden on his mission of investigation of German aeronautical research and production plants, has now spent over three months in Germany engaged in the recovery, classification and translation of relevant documents. On 27th November he delivered a lecture before the Royal Aeronautical Society in which he gave a description of the German research organisation, an account of the progress made in specific studies, some particulars of practical developments and a statement of current problems as affecting German plant and personnel.

Thousands of papers had been published, but several hundreds have not yet been found. The magnitude of the task renders the translation of all this mass of material impracticable at present. Selected papers will, of course, be translated in full, but the general procedure has been to group the papers and engage German specialists to prepare monographs on specific subjects. This work is still proceeding.

Particular attention was drawn by Mr. Stern to the large number of research stations and the lavish and even over-elaborate nature of the equipment. He stated that in 1943 Germany had fifty-one wind tunnels, some over 20ft. diameter, eight for high speeds below sonic velocity and eight for supersonic velocities. Some test equipment was of novel and complicated character and it seems that the officials had, after years of effort, been able to demonstrate its potential usefulness but had not been engaged on practical work. Throughout the extensive organisation was an appalling lack of co-operation and even of interchange of information. One plant would be painstakingly pursuing a line of investigation in complete ignorance that another station was working on the same problem. Between the research departments of production firms and Government research stations there was virtually no liaison.

In the ensuing discussion many members deplored the fact that the Ministry still treats much German material as "secret and confidential." There appeared to be general agreement that for the benefit of British industry information of German studies and activities should be disseminated as expeditiously as possible.

"Gremlin Task Force"

Japanese Aircrews and Aircraft Flying for the R.A.F. in French Indo-China

By WING CDR. L. V. FRASER

OUT of a bewildering array of captured Japanese aircraft, not inaptly christened the "Gremlin Task Force" by the R.A.F., has been born an air effort that ranges for hundreds of miles across French Indo-China.

Many of the pilots flying in it are Japanese who were once warned that they would be called on for "suicide squadrons" against our invading troops. Some of them still have the treasured Kamikaze scarf, bearing the symbols, "Once to die, seven times to be re-born."

Now that the war is over they have accepted the orders of the Allies. Already, in the first five weeks of their new work they have flown 100,000 miles, carrying a thousand passengers and 45,000 lb. of supplies; and this without a mishap.

The passengers, whom they have taken safely from the Saigon headquarters of the Allied Control Commission in southern French Indo-China to airfields in outlying districts, include British Army officers, French representatives, and Indian troops.

This fantastic situation (as it might have been described a few months ago) has resulted from a serious joint effort to keep the normal life of the country going. It is largely due to the ingenuity of a group of R.A.F. officers that this unique "Gremlin Task Force" has become a lifeline of supply.

Roads round Saigon and other principal towns in the southern part of the country became blocked by Annamite elements immediately the disturbances started, cutting off all contact except by air. The need for additional air effort became urgent, but with Transport Command already fully extended for the evacuation of Allied prisoners and internees from Malaya, Netherlands East Indies, and other parts of South-East Asia, it became essential to supply it on the spot.

So the "Gremlin Task Force" came into being. That is the title, bestowed on it by some R.A.F. pilot, by which it is now known in official files. It consists of twenty surrendered Japanese aircraft, mainly transports, but with a sprinkling of light bombers, photo-reconnaissance aircraft, and singled-engined trainers which have been converted for communication work. All were captured on Saigon airfield or flown-in from other airfields in southern French Indo-China which the Allies took over, and all had ceased to play any part in offensive operations some time before the surrender.

To this odd assortment of aircraft the R.A.F. have given the names of their most traditional "characters" of the war, P/O. Prune and his colleagues, such as W.A.A.F. Winsum and Flt. Lt. Lyne-Shute—names that have become by-words in hundreds of aircrew messes.

Anglo-Jap Ops.

One of the earlier tasks of the G.T.F. was to fly reconnaissance sorties over the flat countryside round Saigon in search of unduly large Annamite gatherings or road blocks that might have been set up to obstruct Allied movements. Both R.A.F. and Army officer observers have gone on these flights, with Japanese pilots at the controls, and two a day are now being regularly flown.

As the ability of the newly formed communication flight to meet the peculiar needs of the local situation became apparent, it was put to diverse uses. It flew 350 French troops and 65 men of the Indian Army to Phnom Penh, ancient capital of the kingdom of Cambodia, now a province of French Indo-China, when conditions in that district became unsettled. The "fly-in" was completed successfully in three days, and avoided the diversion of R.A.F. transport aircraft for that purpose.

Since then a thrice-weekly air service, wholly run by Japanese pilots, navigators and wireless operators in their own aircraft, has been maintained on the 100-mile route to Phnom Penh. French administrators, British intelligence officers, and war correspondents are among the many people it has carried.

Fetching 22,000,000 piastres from an outlying provincial town to French safe-keeping in Saigon was another task for the Japs. There were two tons of banknotes in all. Four Japanese light aircraft, brought in specially from other satellite airfields, each made five sorties in one day to finish the job. Vaccine, quinine tablets from former Japanese stocks, fruit, cooking oil, fish and eggs are among stores flown. French civilians who have been entirely cut off from food supplies, have been saved by this service, which has freed R.A.F. transport aircraft for essential tasks elsewhere in the vast S.E. Asia theatre.

Japanese ground crews help in the servicing, and it was one of their reports on an unserviceable aircraft that momentarily bewildered an inspecting R.A.F. officer when he read that the cause of the complaint was "Electric organ not working." It took a little quick thinking to realise that they meant the generator.

Final Briefing

As you step into one of these former Japanese aircraft on Saigon airfield you find yourself in a rather odd atmosphere. Japanese airmen are finishing the running-up of the engines, while the Japanese aircrews carry out their old pre-flight routine. The captain lines up his crew smartly before the white-painted aircraft, now bearing a R.A.F. roundel on each wing. They salute. He gives them a final briefing. They dismiss with another salute and then solemnly file into the aircraft.

Most of them have been flying on transport units in this area for many months. The pilots are competent and know the route thoroughly, and the only problem is when a Japanese wireless operator tries to contact a British flying control ground station in his own language.

The upholstered interiors of two captured Japanese transport aircraft, holding eight to ten passengers, are the pride of this new airline. They, too, have Japanese crews, some of them transport personnel and others men who had been training for bomber or photo-reconnaissance squadrons; the swift retreat of the Japanese from Burma, and its diminishing air strength, gave them no chance to fly on operations.

Now the "Gremlin Task Force" has an R.A.F. officer in charge, Sqn. Ldr. H. F. McNabb, formerly with an R.A.F. Liberator coastal squadron in Ceylon, and he is assisted by a Japanese-speaking R.A.F. officer, F/O. A. E. Bell. Two other officers, Wing Cdr. G. R. Nottage, D.S.O., A.F.C., and Sqn. Ldr. W. J. Hibbert, D.F.C., had the task of vetting the Japanese pilots before they were passed out for flying duties. Several R.A.F. pilots have flown the Japanese aircraft on duty journeys.

Tailpiece: When the Japanese saw the names of Grp. Capt. Booste, P/O. Prune, A/C. Plonk, and other R.A.F. "characters" (including "Binder" the dog) being painted on the aircraft they decided they must be the names of British air aces. It was felt by R.A.F. squadrons on the airfield that they should not be disillusioned. . . .

The first Sandringham taxies away from its moorings after the launching ceremony. Two Sunderlands can be seen on the slipways in the background.

Luxury on Trial

Minister of Civil Aviation Launches First of the Short Sandringhams

ONE imagines that it must have been with a good deal of trepidation that Short Brothers issued invitations to witness the official launch of the first of the Sandringham flying boats on November 28th. The weather had been far from suitable, and there was quite a chance that it might have proved impossible for flying. The Medway off Short's works is none too ample at the best of times, and with the tide approaching low water there was little room to spare in the fairly poor visibility on the day of the launch. However, Wing Cdr. R. S. Gilmour, D.S.O., D.F.C., acquitted himself very well of what must have been a fairly difficult task in the circumstances, and a considerable number of guests were able to enjoy the comfort, not to say luxury, of the first Sandringham. In the near future the machine will go on operational trials by British Overseas Airways.

The launching ceremony was performed by Lord Winster, Minister of Civil Aviation, accompanied by Lady Winster, whose first flight this was. They expressed themselves pleased with the comfort of the machine. Other guests included Mr. Arthur Woodburn, Parliamentary Secretary to the Ministry of Aircraft Production, and Mr. Hudson Fysh, managing director of Qantas Airways, who is extremely anxious to obtain British aircraft for Australian air routes.

More to Come

At a luncheon following the launch Mr. E. D. A. Herbert, chairman of Short Brothers, extended the thanks of the management to everyone who had worked so hard to get the first of the Sandringhams ready for tests, designers, technicians, workpeople and pilots. He foreshadowed other machines to follow and expressed the pride of the firm in their achievements. He paid a tribute to British Overseas Airways for the layout and general specification of the passenger accommodation in the Sandringham, which had been planned by B.O.A.C., Shorts working to their requirements.

Mr. Woodburn referred to the criticism so often expressed that Great Britain was behind in civil aircraft. If there were any lagging behind it was because Great Britain had mobilised every man and woman for war work, and to a much greater extent than any other country, even the dictator countries, though it had been done voluntarily and democratically. We were now paying the penalty. He thought our friends in America might recognise the fact rather more than they had done.

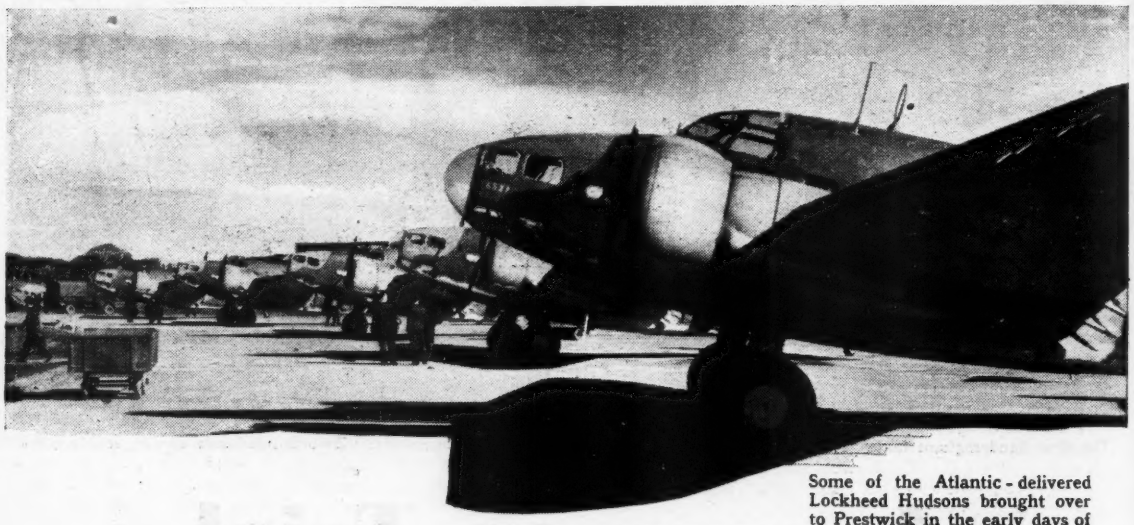
It was true that in this initial post-war period we were in a difficult position, for the reasons he had given, but things were moving fast and it had so happened that new ideas were coming along and a new phase was approaching. At the Ministry of Aircraft Production they were not at all downhearted over the country's position, and in two or three years' time Great Britain would be able to hold her own with any aircraft in the world.

Interior Comfort

Externally the Short Sandringham appears identical with the *Argentina* recently delivered to Buenos Aires for the Dodero shipping line, as is but natural in view of the fact that both are modifications of the Sunderland, but the two interiors are very different. The Dodero requirement was accommodation for 45 passengers, while the Sandringham class is much more luxurious, the space being shared by only 24 passengers by day and 16 at night. Another distinction is that the *Argentina* has four Pratt and Whitney engines, while the Sandringham has four Bristol Pegasus 38s. Incidentally, it is of interest to record that Mr. Tyson has reported that on the flight from England to Buenos Aires the Dodero flying boat averaged one sea mile per gallon of fuel, which must be regarded as remarkably good economy.

The many passengers carried on short flights last week were unanimous in their praise for the Sandringham. One might, perhaps, sum-up their feelings by saying that three freedoms were enjoyed: freedom from noise, freedom from vibration, and freedom from fear. The first two are a result of the careful sound-proofing and general installation of the accommodation. The third results partly from the other two (noise does more than anything to make an inexperienced passenger nervous) but is also largely due to the feeling that as the Sandringham is a flying boat it would be able to alight at any moment on the sea should this become necessary. This is an aspect to which a good deal more attention should be paid. The feeling may to some extent be illusory (the sea is often rougher than it appears when seen from the air), but there is no doubt that it exists.

A detailed description of the Sandringham was published in our issue of July 19th, but it may be briefly recalled that the maximum loaded weight is 56,000 lb., maximum fuel capacity 2,000 gallons, and maximum still-air range 2,200 sea miles.



Some of the Atlantic-delivered Lockheed Hudsons brought over to Prestwick in the early days of the ferry service.

Atlantic Ferry Pool

The Work of the Civilian Delivery Pilots on the Atlantic Run : From "Atfero" Days to 45 Group, R.A.F.

JUST as the work by the civil-trained amateur in the A.T.A. and various Services tends to have been forgotten or even belittled, so the general public is hardly aware of the fact that the bulk of the work of ferrying military aircraft across the Atlantic was done by a civilian team. In the early days it was simply that shortage of pilots with the necessary experience necessitated the recruitment of American, Canadian and British civil pilots for this work, but as their experience increased they became more rather than less useful when Service crews were available in reasonable numbers.

In the autumn of 1940, when Trans-Canada Airlines started the ferry organisation, these pilots, navigators, radio operators and flight engineers were civilians in the extreme sense, but later on, as the organisation developed, the survivors became semi-Service members of the R.A.F. Ferry and Transport Commands, and wore their own distinctive uniform. The word "survivors" is used deliberately, since the human losses in the early days, though small in relation to the number of aircraft delivered, were very considerable. Until bases had been organised in Iceland and Greenland, enabling shorter-range crossings to be made, all the aircraft, including basically unsuitable twin-engined aircraft, were flown direct. Apart from the inevitable possibility of engine failure, which, coupled with icing or even normally bad weather, made the completion of the flight by a twin very problematical, the actual range of many aircraft was inadequate for any but favourable conditions.

Early Hazards

Those early civilian ferry pilots, drawn from all manner of civil flying occupations, had one of the toughest jobs of the war—counterbalanced to some extent only by the facts that they were well paid and that the time gaps between their trips were reasonably long. Losses would probably have been very much greater had it not been for the fact that the pilots brought the aircraft first from Montreal to Gander, Newfoundland, and, in the course of this 800-mile trip, were able to pin down any snags and check fuel consumptions before leaving for the long hop. This last was, in nearly all cases, started at night, and it was no mean feat to make a semi-blind night take-off with a grossly overloaded aircraft.

The organisation in the Canadian Pacific Railway offices in September, 1940, was headed by Mr. Woods-Humphery, formerly managing director of Imperial Airways, and his associate, Col. Burchall. The initial flying team was built up round Capts. Wilcockson, Bennett (now Air Vice-Marshal Bennett, C.B.E., D.S.O.), Page, Ross, Store and G. J. Powell, and the early recruits were interviewed by Wilcockson and Bennett. Early in 1941 M.A.P. became responsible for the work, and the organisation was known as "Atfero." Later in that year it was taken over by the newly formed Royal Air Force Ferry Command, which, under Air Chief Marshal Sir Frederick Bowhill, later became Transport Command as the need for a more embracing set-up became obvious. The Atlantic ferrying part of this Command was No. 45 (Atlantic Transport) Group—the words "Atlantic Transport" being deleted later when operations were started elsewhere.

Later Development

The first aircraft, Lockheed Hudsons, were ferried, in October, 1940, from St. Hubert, Montreal, to Gander, Newfoundland, and to Prestwick. As the number of aircraft increased and began to include larger types such as Fortresses and Liberators, St. Hubert Airfield became inadequate, and in the autumn of 1941 the Montreal base was moved to the new municipal airfield at Dorval. In 1942 the opening of Goose Bay Airfield in Labrador relieved the congestion at Gander. Needless to say, accurate Met. forecasting was more than vital, and this was in charge of Mr. P. D. McTaggart-Cowan ("McFog"), of the Meteorological Division of the Canadian Department of Transport.

Although best known, the North Atlantic route was by no means the only one used for aircraft delivery. Apart from the use of the short-stage route later developed via Greenland and Iceland, Catalina boats were delivered through Darrell's Island, Bermuda—early delivery pilots completing the trip with a tremendous final hop of 22-24 hours' duration—and landplane deliveries were also made through this island when an airfield had been constructed

ATLANTIC FERRY POOL

there. Later on, aircraft were taken to Africa and the Middle East via Natal, Brazil, and, still later, to Australia, via the Pacific and New Zealand.

A still more northern route was also developed—largely through the energies of Capt. McVicar. Quite a big batch of Hampdens were brought over to British Columbia for training purposes via Greenland, Southampton Island and Edmonton. Although the meteorological and air-rescue problems involved in any regular operations over this route must be considerable, it is worth remembering that the "Crimson Route" mileage from Vancouver to Prestwick is only 4,399 miles against the 5,397 miles of the more normal one via Montreal and Newfoundland. Capt. McVicar, now a consultant in Montreal, considers that there are very real possibilities in the Great Circle route between this country and Western Canada.

It is impossible to do full justice to the work of the organisation, which later became known as 45 Group, and it is pleasant to learn that a souvenir book has recently been published for private circulation amongst the civilian aircrew members of the Group. It has been written by Air Commodore Griffith Powell, C.B.E., who was, until recently, the Senior Air Staff Officer of the Group, and may be remembered for his work with Imperial Airways and B.O.A.C. in pre-war days. He was base manager of Gander and Bermuda in the early ferrying period, and succeeded Bennett at Montreal as Flight Superintendent of Atfero. As S.A.S.O., he has been responsible for all the North Atlantic ferry work, and is now managing director of British Aviation Services.

CIVIL AVIATION NEWS

PROTOTYPE FREIGHTER

THE first Bristol Freighter is now nearly due for prototype tests and should be in the air within the coming week. Examples of both Freighter and the Wayfarer—the passenger version—are in production and export orders have already been received. The prototype will be flown by Flt. Lt. C. F. Uwins, who still takes a very active part in development and production test flying work.

CHANNEL ISLANDS BOOM

SINCE reopening their services between the Channel Islands and this country in June, Jersey and Guernsey Airways have carried more than 10,000 passengers—mostly repatriates. This figure gives an average of about 65 passengers a day which, for a fleet of Rapides, and excluding freight, is very good going indeed. Apart from necessary duplications, Channel Islands Airways are at present operating four times every day from Southampton and twice from London (Croydon), with five local inter-island services.

PRESTWICK PLANS

WHATEVER the Government's eventual internal airline network plans may be, Scottish Aviation evidently intend to make the most of the promised "charter freedom." They are reliably reported to have purchased three Liberators and to be considering the acquisition of more for use as long-distance passenger and freight carriers. Even if the company is reduced only to charter operations these, if on a sufficiently large scale, will be more or less indistinguishable from the real thing.

THIS ATLANTIC

TWO interesting commercial crossings of the Atlantic were made recently. An American Airlines DC-4, with fourteen passengers, made the run from Washington to this country via Philadelphia, Gandar and Rinneana, and Trans-Continental and Western Air made a civil "record" using their first Lockheed Constellation. On her maiden trip and with favourable conditions this T.W.A. Constellation crossed from Gandar to Rinneana in a flying time of 6 hrs. 53 mins. The previous best, apart from times made by military aircraft, was that of a B.O.A.C. Liberator, which made the trip to Prestwick early this year in 7 hrs. 18 mins.

Pan American Airways have placed an order for twenty Boeing Stratocruisers, some of which will no doubt be used on their Atlantic Service. The Boeing 377 version of the Stratocruiser has reverse-thrust airscrews, which were first used on one or two B-29s in the Pacific war in case it was necessary to cope with short-field emergency landings.

Following the application of the Swedish Inter-Continental Air Lines section of A.B.A. for permission to run service between Scandinavia and the United States, the Royal Norwegian Air Transport Company have now applied for sanction to make two flights weekly between Oslo, Stavanger, New York and Chicago. Douglas DC-4s will be used. American Air Lines Overseas Division have, of course, already been authorised to extend their Atlantic service to Scandinavia.

Meanwhile, Lord Halifax has been taking up the question of competitive trans-Atlantic service fares with the U.S. Assistant Secretary of State. It is understood that the British view is that the airline companies of the two countries should agree to charge similar rates. Under any such arrangement P.A.A., who recently began passenger carrying at first-class steamship rates, would need to step up their fares to the level considered by B.O.A.C. to be suitable for economic working. P.A.A. and B.O.A.C. already have an agreement with the British Government giving each the right to operate two Atlantic round trips weekly. Pending further negotiations, P.A.A. and American Airlines are each operating as many as five flights weekly. Since frequency is a matter solely of available equipment, there seems to be no reason why the American operators should not run as many services as they wish, but it is doubtful whether the DC-4s present Atlantic payload justifies fare reduction even with good "utilisation." It may be a different story when Constellations and Stratocruisers are in service.

OUR FIRST AGREEMENT

WITHIN forty-eight hours of Mr. Ivor Thomas's arrival in Athens an agreement had been reached with the Greek Government for the reciprocal operation of two air services a week between the two countries. Those from this country will, of course, be operated by B.O.A.C., no doubt as a part of their more extensive Empire services. Two routes are mentioned, one through Central Europe and the other through France and Italy. The Greek plans have not yet been announced. Mr. Thomas is reported to be visiting Portugal this week on a similar errand.

NATIONALISATION IN N.Z.

WITH the passing of the Bill empowering the New Zealand Government to operate internal and external air services, this Dominion is making its first big move towards air nationalisation. The Bill provides for the establishment of a National Airways Corporation, with five directors appointed for a term of three years. It gives the Government power to establish, maintain and operate air services in New Zealand and to take over the assets of any existing companies. The Bill also provided the authority for the Corporation, with Government approval, to operate air services outside New Zealand.

According to one correspondent, at least, the public reaction to the Bill seems to be that such nationalisation is inevitable, but that the ability of the Government to handle such a rapidly developing service is doubted.

TRANS-CANADA PLANS

TRANS-CANADA AIR LINES has now had its capital increased by Act of Parliament in preparation for trans-oceanic operations. The North Atlantic service from Montreal to Prestwick is running, and by next autumn it is expected that a West Indies and Latin-America service will be in operation, as well as a service to Australia and New Zealand, via Russia, China and Japan. T.C.A. will set up subsidiary companies for the operation of non-domestic services so that other countries may, when legally necessary, buy shares.

It has also been hinted that the airline now owned and operated by the C.P.R. is to be officially divorced from surface transportation control and operation by next May. Regional private operating companies will be permitted to operate feeder lines, and, if necessary, will be subsidised to ensure the maintenance of an adequate service.

T.C.A. hopes to have Douglas DC-4M aircraft, built or converted by Canadair, of Montreal, in use by September, 1946.

CIVIL AVIATION NEWS

on all main routes. The first converted DC-3 went into T.C.A. service early last month on the New York-Toronto run. All war restrictions have now been lifted on civil flying in Canada.

IRELAND DIRECT

WITH the delivery of their new Avro XIXs, Railway Air Services were due last Monday to open the promised London-Dublin and London-Belfast non-stop services. The former will be operated daily except on Sundays, and is in addition to Aer Lingus Teoranta's service which was started on November 9, while the latter is additional to the existing London-Liverpool-Belfast "connection" service which is already in action. As already announced, the Avros will be replaced, for these longer non-stop services, by Vickers Vikings when these are available early next year.

For the benefit of those who find the internal air transport situation somewhat confused, it may be explained that, pending the results of Government plans, R.A.S. and their associated companies are, apart from Allied Airways, the only internal operators. The associated companies are: West Coast Air Services, I.O.M. Air Services, Scottish Airways, Great Western and Southern Air Lines and Channel Isles Airways. G.W. and S.A.L. operate between Land's End and the Scillies four times daily, while Channel Isles Airways include Jersey Airways and Guernsey Airways.

K.L.M. AGAIN

ALTHOUGH at present K.L.M. are operating services between Amsterdam and this country and are preparing to operate between Amsterdam and the East Indies only under the auspices of the Netherlands Government Air Transport Service, next year should see this old-established airline company well under way. Early last month the first post-war Batavia-bound aircraft, a D.C.4, left Schiphol carrying various K.L.M. officials and, though the Far Eastern line will, for a start, be mainly concerned with work of a repatriative nature, a daily "civil" service should be under way before the spring of next year. In addition, as already recorded, the company hopes to have an Atlantic service in operation before the autumn, and another service to Dutch Guiana, via Dakar and Para, is planned to start at about the same time. Presumably, Constellations will be used for the two long-distance over-water services, while D.C.4s, eighteen of which have been ordered, will be used for the shorter-stage overland services.

This sort of planning tends to make people wonder whether we are quite right in disdaining to use American aircraft as stop-gaps for our services. It is, one supposes, a question of balancing the disadvantages of dollar-spending against the advantages of having a good foothold on the most useful routes—with the added doubt whether modern American aircraft will be available much before our own types can be put into service.

COLOMBO–SYDNEY

SYDNEY has now become the terminal for Qantas Empire Airways "Kangaroo" Liberator service, which was introduced last year to supplement the original Catalina service across the Indian Ocean between Perth and Colombo.

The change of terminal has been necessitated by post-war developments and a step towards the restoration of the services on the pre-war Australia-England route through Darwin and Singapore. Previously, westbound Liberator services were operated between Perth, Learmonth and Colombo, while eastbound flights had made the crossing direct from Colombo to Perth. The Liberator services are now routed from Sydney to Learmonth and thence to Colombo, each way, on a twice-weekly frequency.

MERLINS FOR SKYMASTERS

THE Douglas DC-4M transports which are being built in Canada for Trans-Canada Air Lines will be fitted with Rolls-Royce "150"-series engines. The decision so to power the Skymasters—remarkable in view of the fact that American competition is, so to speak, on the very doorstep—was reached after more than two years of Atlantic operation with converted Lancasters. By actual comparison the Merlin was found to be superior for this long-distance, high-altitude work to air-cooled or liquid-cooled American engines.

The special DC-4s are being built by a Government-owned factory, Canadair, Ltd., of Montreal, to the specification of the Douglas Corporation, and will be used on the company's long-distance routes as well as those planned for the Atlantic and Pacific. The Merlin "150"-series being installed have been specially developed for civil flying and have a rating, with two-speed two-stage superchargers, of 1,325 b.h.p. at 20,750ft. in f.s. gear. Later versions of the Canadian Skymaster will have pressurised cabins.

T.C.A. have been operating a Lancaster mail and V.I.P. service between Montreal and Prestwick since 1943, and the crews have now made more than 450 crossings—often through from Dorval, Montreal, a non-stop distance of 2,900 miles.

DISCONTINUITY

AT a meeting last week of the Conservative Party Civil Aviation Committee, Lord Swinton, the chairman, gave a broad outline of the Opposition's plan for civil aviation when and if they are returned to power. He explained that they would hold themselves free to dissolve or vary the constitution of any nationalised company if this was necessary to improve air travel facilities and to increase the efficiency of air transport generally. It would be their policy to set up an independent tribunal to which any intending operator could apply for final decisions in the matter of internal or external services.

Lord Swinton described the coalition's civil aviation White Paper as being "dead," since this had been killed by the present nationalisation scheme, and an entirely new policy would, therefore, be introduced. After sacrificing civil developments as we had done in order to concentrate on the war effort, now, he thought, was the time to bring in individual initiative rather than to provide undesirable uniformity in a new and growing industry. His party did not agree with the nationalisation of airfields and considered that the Ministry of Civil Aviation could discharge all its proper duties by providing meteorological, radio and control facilities. Now that the war necessity for the control and allocation of manufacturing capacity no longer existed, M.A.P. was not necessary, and operators should be free to place their own orders direct. Where aircrew and other employees were concerned, nationalisation deprived them of their natural right to change from one firm to another if they were dissatisfied.

Whatever theoretical arguments might be advanced for nationalising a fully established non-competitive domestic industry, these arguments could have no validity in a comparatively new "industry" in which we should be meeting the keenest competition from foreign enterprise.

LOSS OF THE PROTOTYPE HERMES

IT was a cruel stroke of fortune which, last Sunday, overtook those responsible for the Handley Page Hermes on its first test flight at Radlett. Until official enquiries have been made it would be useless to speculate on the reason why the four-engined 34-seater crashed within a few minutes of taking off, though it appears from eye-witness accounts that there may have been some difficulty with fore-and-aft control.

Flt. Lt. Talbot.

Last Monday's newspaper headline "Two Years' Secret Work Lost in Air Liner Crash" is, of course, typical of such misfortunes as this. Actually, though the programme is bound to suffer delay, work on the Hermes design will proceed as quickly as possible.

Two members of the Handley Page organisation lost their lives in the accident, the chief test pilot and a test observer.

The pilot, Flt. Lt. James Richard Talbot, 36 years of age, came from the Fleet Air Arm in July, 1937, to join the firm as assistant test pilot, and was appointed chief test pilot in October, 1941. He made the first test flight of the Halifax and subsequent development tests. All who knew him will extend sympathy to his widow and three children.

The test observer, Edgar Alexander ("Ginger") Wright, 31 years old, was chief of the Handley Page test observers' office. He joined the firm as a boy in the drawing office in September, 1931, and started his apprenticeship in 1933, since when he has specialised in the recording side of test work.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

ECONOMICS OR EXTRAVAGANCE?

Surplus Flying Boats as Houses?

I WAS interested in C. Vinten's letter in *Flight*, November 15th, and with regard to his query, the answer is a resounding NO! Obviously he has not experienced (a) the space available, even in a Sunderland; (b) the wonderful extremes of temperature that can be experienced through the 18-gauge skin of a grounded aircraft, even in this country.

I hope you will continue "Indicator's", interesting handling impressions of war aircraft. R. GREEN.

[Further articles in "Indicator's" series are in preparation. —ED.]

Waste of Material, Not Money

WHILE agreeing with the views of your correspondent, G. A. Chamberlain, on the disposal of surplus parachutes (*Flight*, November 22nd), I would like to point out that he has a mistaken impression regarding "a natural instinct" on the part of "certain sections of the taxpaying community," which I think must have been prompted by remarks in correspondence of mine published in *Flight*, November 8th.

What I would like to clear up is the fact that I am not worried by the thought that money I have given to the Government in the form of taxes has been wasted. I wrote to ask that surplus aircraft and equipment should not be destroyed because I think it is an appalling waste when they could be used to help transport food and supplies to Europe and other areas, or could be used to give Britain much-needed capital by selling them cheaply to friendly nations for their own security.

While on the subject of surplus equipment, why is it that the Ministry of War Transport persist in sending out circulars to the effect that reconditioned Service vehicles can only be given to priority people, when thousands of ex-Service cars, light vans, etc., lie rotting in dumps all over the country, apart from the ex-N.F.S. vehicles, requisitioned in an emergency and now being broken up Really, the official mind gets worse and worse JOHN C. BRAY.

LONG-RANGE ROCKETS

Gliding Angles and Stability

AS one of the technicians acquainted with the aerodynamics of long-range rockets, may I be permitted a few words in reply to Mr I. G. Henry? (*Flight*, November 22nd).

The reason the gliding angle of the "New York Rocket" is so small is merely because the rocket has a very high initial speed to use up and the path is flatter than in the corresponding glide at constant velocity. If V_1 is the initial velocity at the beginning of the glide path at height h, and V_2 the final (i.e., landing) speed, the range in the glide is very roughly equal to

$$h=\frac{V^2_1-V^2_2}{2g}\times(\text{lift/drag ratio})$$

Taking account of the correct units, it will be seen that an overall L/D of just over 5 has been assumed, which, as Mr. Henry will no doubt agree, is very reasonable even for supersonic flight.

As for the stability in vertical flight, this is improved by the high longitudinal acceleration, which is a stabilising force in itself. The problem is similar to that encountered on the A.4, the most difficult period being the take-off, for which, however, the jet vanes can supply adequate control. The problem of wing stressing has not been overlooked: it can be assumed that the wings are set at zero incidence to the rocket axis and are not intended to supply any lift during the powered ascent, and it is noticeable that none of the subsequent manœuvres implies more than a 5g normal acceleration, and that the wing loading with all fuel gone is only 35 lb./sq. ft.

The last query with regard to the elliptic orbit correction involves laborious mathematics, but to a first approximation it is equal to a fractional increase in range of value about $\frac{R}{2r}$ where R is the range for the ordinary parabolic case, and r is the earth's radius. (In the case of the operational A.4 this amounts to about 5 miles.)

Finally, a word of caution in Mr. Henry's ear before again taking to task the words of anyone of Mr. Perring's calibre!

A CIVIL SCIENTIST.

AIRCRAFT ENGINEERS

Skilled Men's Employment Problem

AS a regular reader of some 18 years' standing, may I bring to notice the plight of a considerable number of skilled aircraft engineers and the attitude of National Service officials to their problems?

In the early war years, these experienced workers accepted transfers to shadow factories and sub-contract undertakings, to form a nucleus of skilled labour in the over-inflated industry. Owing to the cancellation of contracts, this labour is now being dumped on the market.

In my own case, with 18 years' experience and G.E.'s licences, the National Service officer stated that I should probably be unemployed some six months, and a Man-power official blandly suggested that I should accept training for entry into another industry.

In view of the dangerous competition offered by our American cousins, surely full use should be made of the labour potential within the aircraft industry before "elevating" members of it to the "pre-fab" building trade.

G.E.4279.

A Question of Dilution, Not Skill

WITH REGARD to the letter published in *Flight*, November 22nd, from Miss (or Mrs.) Patricia Parker, I would like, if I may be permitted through the medium of your columns, to enlighten her upon one or two points. In the first place, "the crux of the problem," as she puts it, is not the question of who or not is a skilled maintenance engineer, but who or not is a "dilutee."

Perhaps Patricia Parker has never heard of the "Relaxation of Customs Agreement" which specifies a return to the labour conditions prevailing in engineering, aeronautical or otherwise, prior to 1939. Perhaps she does not realise that this means the removal from skilled status of thousands of civilians and Servicemen who were specially trained by the Government to see the industry over its wartime emergency, and who, in our opinion, are deserving of a better fate than the somewhat cavalier discard selected for them by a bureaucratic Government department and the "craft" unions who have simply used them to fill their depleted coffers.

As for the standards of flying safety, speaking from the point of view of one who has worked, both before and during the war, on quite a considerable number of airframes (including Tiger Moths), I can say that these so-called "dilutees" have done a good job of work quietly and conscientiously in conditions that were often trying and sometimes extremely difficult, but even in the rush days of the Battle of Britain there was no slackening of the effort of these men to turn out workmanship of the highest possible order.

If Patricia Parker would like to communicate with me further to this, I shall be only too glad to add to her knowledge of the aims, objects and *raison d'être* of the Aeronautical Engineers' Association. J. S. STANESLY

(Secretary, S.W. District Committee, Aeronautical Engineers' Association).

FOR YOUR DIARY

THE Society of Instrument Technology has arranged the following programme of meetings for the current season:

Thursday, December 13th.—"Automatic Temperature Control," by Mr. G. H. Farrington.

Tuesday, January 22nd.—"Electronic Controls for Resistance Welders" (with sound film), by Mr. B. G. Higgins.

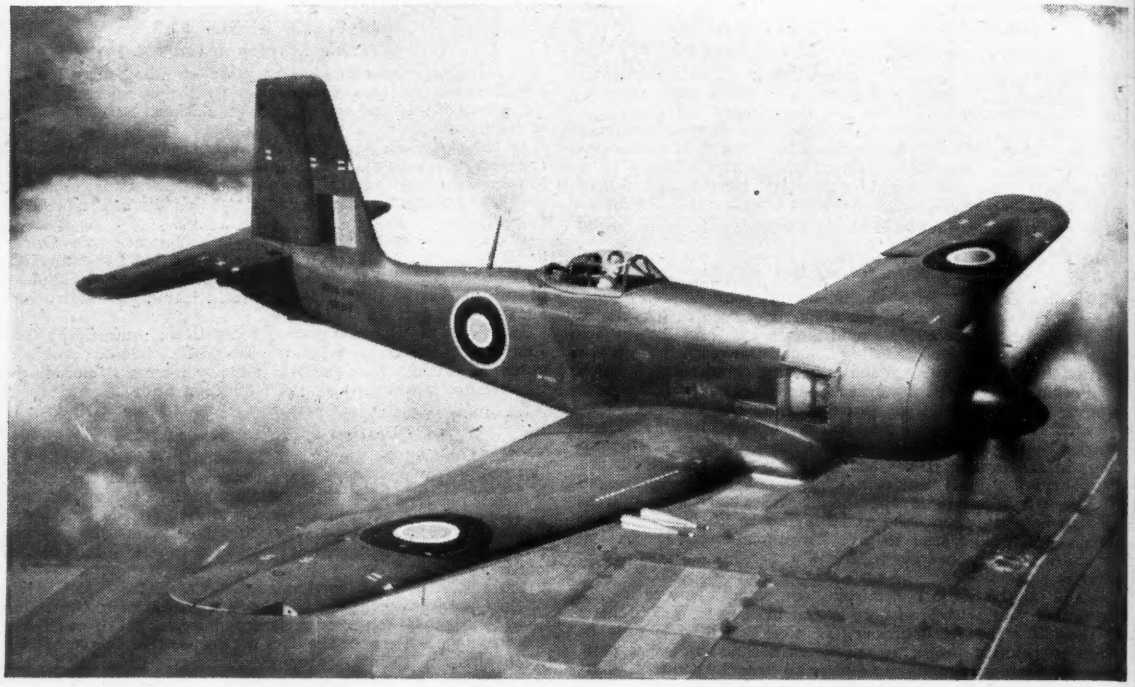
Tuesday, February 26th.—"The Effect of Design on Boiler Auxiliaries on the Choice and Performance of Automatic Control," by J. E. O'Breen.

Thursday, April 4th.—"Production of Charts for Recording Instruments," by Mr. L. B. Lambert; "Recorder Inks," by Mr. C. S. Harman; "Recorder Pens," by Mr. F. C. Knowles; "Recorder Clocks" (author to be announced later).

Tuesday, May 28th.—"The Design of Automatic and Manually Operated Control Systems," by Dr. A. Porter.

All these meetings will be held at the London School of Tropical Medicine, Gower Street. Times for these meetings had not been announced by the Society up to the moment of going to press.

SERVICE AVIATION



MULTI-PURPOSE : A fine aerial study of the Blackburn Firebrand. The complexity of the Firebrand's functions demands that its pilot be very adaptable, since he must not only fly the aircraft, but aim the torpedo and navigate as well.

Royal Air Force and Naval Air Arm News and Announcements

New Middle East Air Chief

AIR MARSHAL SIR C. E. H. MEDHURST has been appointed Air Commander-in-Chief, R.A.F., Mediterranean Middle East.

Air Marshal Medhurst, who is 49, became A.O.C.-in-C. Middle East in February, and before that was Commandant of the R.A.F. Staff College. He was appointed Assistant Chief of the Air Staff (Intelligence) in 1941.

With the reduction of Forces in the two theatres, H.Q. Mediterranean and Middle East Command, hitherto located near Naples, is now merged with H.Q. R.A.F., Middle East (Cairo).

The whole movement from Italy of men and equipment was carried out entirely by air.

Awards

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations :—

Distinguished Service Order

Act. Wing Cdr. I. G. BROOM, D.F.C., R.A.F.V.R., No. 163 Sqn.—Since the award of a second Bar to the D.F.C. this officer has completed numerous sorties, many of which have been directed against Berlin. Throughout he has displayed the utmost fortitude, courage and determination. At no time has enemy opposition deterred him from completing his allotted tasks. Wing Cdr. Broom has at all times set a high standard of devotion to duty.

Act. Wing Cdr. W. K. DAVISON, D.F.C., R.A.F.V.R., No. 85 Sqn.—Wing Cdr. Davison is an outstanding squadron commander who has always displayed the utmost courage and determination. He has participated in attacks against flying bombs, destroying one. Under his leadership his squadron has destroyed forty of these missiles. In February, 1945, Wing Cdr. Davison destroyed an enemy aircraft near Molbis despite adverse weather. Ten days later he destroyed another enemy aircraft near Munich. Wing Cdr. Davison's outstanding record has been an inspiration to his squadron.

Act. Wing Cdr. W. G. FOXALL, D.F.C., R.A.F.V.R., No. 109 Sqn.—Wing Cdr. Foxall has completed two tours of operational duty, and since the award of the D.F.C. he has taken part in many attacks against some of the most heavily defended targets in Germany. The splendid results this officer obtained caused him to be selected to open major tactical attacks in support of our armies. As a flight commander he has set an inspiring example by his fearless courage and devotion to duty and, under his fine leadership, his flight has maintained a high standard of operational efficiency.

Act. Wing Cdr. B. S. JONES, D.F.C., R.A.F.O., No. 692 Sqn.—Wing Cdr. Jones has been in command of his squadron since February, 1945. During that time his fine fighting spirit, brilliant leadership and inspiring example have been reflected in the high standard of operational efficiency maintained by his squadron and the many outstanding successes attained.

Act. Wing Cdr. R. C. E. LAW, D.F.C., R.A.F.V.R., No. 109 Sqn.—Since the award of the D.F.C. Wing Cdr. Law has completed many successful missions. He has proved himself a fearless pilot, and his courage and determination in the most hazardous circumstances have set a fine example to all who have served with him. His skill and ability have contributed in no small way to the success of his squadron, which has taken part in many important operations under his leadership.

Act. Wing Cdr. W. M. MASON, D.F.C., R.A.F.V.R., No. 97 Sqn.—Since the award of the D.F.C. this officer has completed a second tour of operational duty. He is a leader of outstanding ability whose high sense of duty and magnificent example have been potent factors in ensuring the success of the many operations completed by his flight. As a navigator Wing Cdr. Mason has consistently displayed exceptional skill and determination. On one occasion in March, 1945, despite very adverse weather he brought his aircraft to the target, a German oil plant at Bohlen, exactly on time. In the face of intense enemy opposition the target indicator was correctly placed and a successful attack completed.

Bar to Distinguished Flying Cross

Act. Wing Cdr. E. A. O. MANGE, D.F.C., R.A.F.V.R., No. 635 Sqn

Act Wing Cdr. M. A. SMITH, D.F.C., R.A.F.V.R.

Act. Sqn. Ldr. D. J. BUTTERS, D.F.C., R.A.F.V.R., No. 7 Sqn.

Badge of No. 823 Squadron, Naval Air Arm — "Vigeur ' de Dessus" (Strength from Above). On a white field, per fesse, and barry wavy of four blue and white, an eagle volant to the sinister black in chief, and in base a Maltese cross per pale white and red.

Badge of No. 1770 Squadron, Naval Air Arm—"videre est vincere" (To See is to Conquer). On a blue field issuant from waves barry wavy of four white and blue a trident, gold, on the middle prong thereof a firefly lambent proper.

SERVICE AVIATION

Act. Sqn. Ldr. K. C. GOOCH, D.F.C., R.A.F.V.R., No. 35 Sqn.
Act Sqn. Ldr D. F. MILLER, D.F.C., R.A.F.V.R., No. 635 Sqn.
Act. Sqn. Ldr. D. A. J. MOREY, D.F.C., R.A.F.V.R., No. 7 Sqn.

Distinguished Flying Cross

Sqn. Ldr. L. G. GEORGE, R.A.A.F., No. 163 Sqn.
Flt. Lt. W. G. GARDNER, R.A.A.F., No. 625 Sqn.
Flt. Lt. N. H. NIXON, R.A.A.F., No. 218 Sqn.
Flt. Lt. H. C. RICKETTS, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Act. Flt. Lt. T. B. BAKER, R.A.A.F., No. 630 Sqn.
Act. Flt. Lt. H. M. BAYLISS, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Act. Flt. Lt. K. G. BEETSON, R.A.A.F., No 158 Sqn.
Act. Flt. Lt. J. H. BRIDGETT, R.A.A.F., No. 10 Sqn.
Act. Flt. Lt. R. A. CHOPPING, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Act. Flt. Lt. A. J. CLARSON, R.A.A.F., No. 186 Sqn.
Act. Flt. Lt. R. K. DEAR, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
Act. Flt. Lt. A. DOWLING, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Act. Flt. Lt. D. A. GOUDIE, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Act. Flt. Lt. P. GROVES, R.A.A.F., No. 170 Sqn.
Act. Flt. Lt. E. HALL, R.A.A.F., No. 462 (R.A.A.F.) Sqn.
Act. Flt. Lt. N. G. JUDGE, R.A.A.F., No. 83 Sqn.
Act. Flt. Lt. K. N. S. LEWIS, R.A.A.F., No. 15 Sqn.
Act. Flt. Lt. J. D. O'BRIEN, R.A.A.F., No. 186 Sqn.
Act. Flt. Lt. W. H. STUART, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. K. R. ALLEN, R.A.A.F., No. 227 Sqn.
F/O. D. R. ARROWSMITH, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. D. K. BARKER, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. E. C. BETTY, R.A.A.F., No. 195 Sqn.
F/O. A. E. BLAKELEY, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. W. K. BOXSELL, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
F/O. R. McK. CAMPBELL, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. E. W. COOK, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. D. R. DENEHY, R.A.A.F., No. 158 Sqn.
F/O. R. J. DOBSON, R.A.A.F., No. 35 Sqn.
F/O. K. S. FREARSON, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. R. P. FRANKLYN, R.A.A.F., No. 550 Sqn.
F/O. A. J. GILBERT, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. R. C. HARKISS, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. E. R. JARMAN, R.A.A.F., No. 170 Sqn.
F/O. I. F. LILLECRAPP, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Wing Cdr. F. W. BALL, R.C.A.F., No. 415 (R.C.A.F.) Sqn.
Wing Cdr. K. A. FRANCE, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
Sqn. Ldr. P. J. HORAN, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. G. W BENNETT, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. C. W. CONQUIST, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. R. W. GREEN, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. H. W. WILKIE, R.C.A.F., No. 138 Sqn.
Flt. Lt. J. W. ACHESON, R.C.A.F., No. 576 Sqn.
Flt. Lt. L. G. BARNES, R.C.A.F., No. 109 Sqn.
Flt. Lt. A. R. A. BEWS, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
Flt. Lt. W. L. BOLENDER, R.C.A.F., No. 142 Sqn.
Flt. Lt. F. E. BOND, R.C.A.F., No. 582 Sqn.
Flt. Lt. H. D. BRACKEN, R.C.A.F., No. 403 (R.C.A.F.) Sqn.
Flt. Lt. N. H. BROWN, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
Flt. Lt. C. K. COCHRAN, R.C.A.F., No. 170 Son.
Flt. Lt T. COGHLAN, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
Flt. Lt. C. C. COLLINS, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Flt. Lt. J. L. COULTER, R.C.A.F., No. 635 Sqn.
Flt. Lt. A. S. CRUIKSHANK, R.C.A.F., No. 415 (R.C.A.F.) Sqn.
Flt. Lt. R. R. FLYNN, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Flt. Lt. R. GALL, R.C.A.F, No. 408 (R.C.A.F.) Sqn.
Flt. Lt. J. D. GILMORE, R.C.A.F., No. 626 Sqn.
Flt. Lt. J. GLENESK, R.C.A.F., No. 166 Sqn.
Flt. Lt. R. J. HENRY, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
Flt. Lt. D. T. MAGEE, R.C.A.F., No. 429 (R.C.A.F.) Sqn.

Army

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in Burma :—

Distinguished Flying Cross

Capt. (temp.) W. BOYD, Royal Regiment of Artillery.
Capt. (temp.) S. N. HARRISON, Royal Regiment of Artillery.
Capt. (temp.) P. J. MCLINDEN, Royal Regiment of Artillery.

Foreign Decorations

THE KING has granted unrestricted permission for the wearing of the undermentioned decorations conferred upon the officers indicated in recognition of valuable services rendered in connection with the war :—

Conferred by the Belgian Government

Order of Leopold (Grand Officer) and Croix de Guerre (with Palm)

Air Marshal Sir Arthur CONINGHAM, K.C.B., D.S.O., M.C., D.F.C., A.F.C., R.A.F.

Conferred by the President of the United States of America

Distinguished Service Medal (Naval)

Air Chief Marshal Sir W. Sholto DOUGLAS, K.C.B., M.C., D.F.C., R.A.F.

Legion of Merit (Degree of Officer)

Brig. J. T. DURRANT, C.B., D.F.C., S.A.A.F.
Col. P. E. STABLEFORD, S.A.A.F.
Wing Cdr. E. A. HOWELL, O.B.E., D.F.C., R.A.F.

Roll of Honour

Casualty Communiqué No. 553.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 202 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—P/O. R. J. G. Beard; W/O. W. F. Bolton; Flt. Sgt. F. Bridge; Act. Flt. Lt. W. E. Brooks; W/O. E. A. Brown; Act. Sqn. Ldr. J. F. Carlyle; Flt. Lt. A. E. L. Claesen; Flt. Sgt. R. A. Flood; W/O. K. A. C. M. Gavin; Flt. Sgt. H. K. Harper; F/O. A. S. J. Holder, D.F.C.; P/O. C. Jolly; Flt. Sgt. J. R. Lewis; Flt. Sgt. D. Maddock; P/O. F. A. Morris; Flt. Sgt. D. I. Mutton; W/O. P. M. Nicholls; Sgt. L. Platts; F/O. J. C. Stone; Act. Wing Cdr. G. F. H. Webb, D.F.C.; Flt. Sgt. H. R. Williams.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. Hughes; Sgt. L. Hunter; Sgt. H. Wright.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. Adams; P/O. J. G. Allen; Sgt. W. G. Angles; Flt. Lt. G. J. Aylott; F/O. P. B. Bailey; Sgt. R. F. G. Bailey; Sgt. W. A. Baxter; Sgt. J. Bender; Sgt. F. Bowman; W/O. F. C. Brittain; Flt. Lt. G. B. Brooker; P/O. G. C. Buglass; Sgt. R. W. Bullen; P/O. G. H. S. Burwood; P/O. S. Campbell; Sgt. W. S. Campbell; Sgt. C. F. Cantwell; Flt. Sgt. J. G. Chadwick; Sgt. E. G. Chapman; P/O. W. R. Chapman; Sqn. Ldr. R. B. Cleaver; Sgt. K Clough; Act. Flt. Lt. R. E. Cook; P/O. P. Cowie; F/O. W. M. Crumbley; Sgt. A. C. Crumpton; Sgt. C. Custance; Sgt. D. F. Dales; P/O

R.A.F. WAR COMMANDERS

Air Marshal Sir Arthur Coningham

Caricature portrait by Hayden

AIR MARSHAL SIR ARTHUR CONINGHAM, D.S.O., M.C., D.F.C., A.F.C., is *par excellence* the air friend of the Army. It may be said, with regrets, that in 1940-41 the Army and the Air Force had no very real idea of how to work together. Neither Service understood the other. That was all changed when Sir Arthur Coningham became A.O.C., Desert Air Force, towards the end of 1941. From this beginning he created the 1st Tactical Air Force. Sir Bernard Montgomery once said: "The Desert Air Force and the Eighth Army are one. We do not understand the meaning of 'Army co-operation.' When you are one entity you cannot co-operate. If you knit together the power of the Army on land and the power of the air in the sky, then nothing will stand against you and you will never lose a battle."

So successful was the work of Sir Arthur in Africa that the Air Ministry promptly abolished the Army Co-operation Command, and in its place formed the 2nd Tactical Air Force. Sir Arthur was brought home to take command of it before the invasion of Normandy. Up to the time of the surrender of Germany he continued his masterly work of giving the Army everything which could possibly be expected from the air. His work was so complete that it is beyond all praise. It is not to die with the sounding of the "cease fire," for the commander of one of his Groups is now Commandant of the School of Air Support, where Coningham's work and methods are being studied and carried on for the advantage of future ages.

Sir Arthur is a New Zealander, and his nickname of "Maori" has naturally been corrupted into "Mary." In the first world war he was in the Canterbury Mounted Rifles and served with them at the capture of Samoa and in Gallipoli. In 1916 he transferred to the R.F.C. In the inter-war years he had much to do with Coastal Command, and was for a time on the staff at Cranwell. Since the disbandment of the Tactical Air Forces Coningham has been appointed Air Officer Commanding-in-Chief, Flying Training Command.

SERVICE AVIATION

M. A. H. Davis; Sgt. T. L. Dawes; Sgt. W. R. Dryburgh; F/O. J. Fielden; Sgt. D. Finlayson; Act. Sqn. Ldr. D. R. Fisher, D.F.C., D.F.M.; F/O A. H. Ford; Flt. Sgt. M. F. George; Flt. Lt N. S. Green; Sgt. H. Grisdale; W/O. J. W. Hall; Sgt. G. C. Hanson; Sgt. S. S. Harper, Sgt. F. W. Herbert; Sgt. E. W. Heywood; Sgt. J C. Higginbottom; Sgt. T. E. Hill; Flt. Sgt. G. S. Holland; Sgt. N. Howarth; F/O. R. P. Howe; Sgt. G. A. Hubbard; Flt. Lt. G. C. D. Hunter; W/O. C. H. T. Hurley; Sgt. C. M. Hurley; F/O. J. G. Jannings; P/O. B. R. Jardine; F/O. R. W. Jones; Sqn. Ldr. S. D. Jones, D.F.C.; Flt. Lt. A. H. E. Kahn; Sgt. D. J. A. Kemp; F/O. A. Kidd; Sgt. W. McG. Latimer; Sgt. J. E. Legg; W/O. F. Lofthouse; Sgt. R. P. Lucas; Sgt. H. McGuigan; Sgt. J. M. McKay; F/O. A. G. McLean; F/O. G. R. Manley-Tucker; Flt. Sgt. W. S. Marchant; Flt. Sgt. F. A. Meeghan; Flt. Sgt. H. A. Monsen-Elvik; F/O. W. Morris; Flt. Sgt. A. S. Nairn; F/O. J. A. Orr, D.F.C.; Sgt. A. T. Paget; Sgt. P. J. Parker; Sgt. A. C. Parkhill; Flt. Sgt. R. W. Peel; Act. Wing Cdr. K. Petrie; Sgt. A. Pinder; W/O. M. C. Richards; Sgt. R. J. Rolfe; F/O. S. E. Rotherham; Flt. Sgt. A. F. Sammes; P/O. D. Shenton; F/O. L. N. Simpkin; Sgt. H. Skutt; Flt. Sgt. E. G. Smart; Sgt. A. Smith; Flt. Sgt. C. G. Smith; F/O. C. A. Smith, D.F.M.; Sgt. P. Stamper; Sgt. R. J. H. Tuddenham; Sgt. J. Turner; Sgt. H. J. Wakeford; Sgt. E. O. Walker; Sgt. A. Walmsley; F/O. J. W. Warrington; Flt. Sgt. J. M. A. Watson; Sgt. J. M. Watts; F/O. L. A. Watts; F/O. J. K. Weir; Sgt. A. Whitworth; Sgt. W. S. Whyte; Sgt. R. A. Williams; Flt. Lt. R. H. Williams, D.F.C.; P/O. E. B. Wilson; Flt. Sgt. A. G. F. Wood; Act. Sqn. Ldr. D. R. C. Wyness, D.F.C.

WOUNDED OR INJURED IN ACTION.—Sgt. B. I Parkinson; Act. Flt. Lt. J. Phillips; Act. Flt. Lt. N. A. Sadleir; F/O. I. Scott.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. T. A. Parkinson.

MISSING, BELIEVED KILLED IN ACTION.—F/O A. L. Heath.

MISSING.—Flt. Sgt. W. L. Allen; Sgt. A. M. Bagnall; Flt. Sgt. T. L. Brunton; F/O. E. Chadwick; Flt. Lt. M. T. Clarke, D.F.C.; F/O. K. N. J. Croft; Flt. Sgt. J. R. Cross; F/O. J. R. Eyton-Morgan; Flt. Sgt. H. W. Felton, D.F.M.; F/O. D. A. Forrester; F/O. A. G. R. Hallas; Flt. Sgt. R. S. Harding Klimanek; Flt. Lt. St. J. Hawkins; Flt. Sgt. R. H. Healey P/O. K. A. J. Hewitt; Flt. Sgt. J. T. Knox; W/O. R. F. Mackrill; F/O. N. B. Mansell; F/O. L. M. Matthews; Sgt. R. H. Nelson; F/O. D. E. Palmer; Sgt. A. W. Pannell; Act. Sqn. Ldr. J. L. Powell; Sgt. E. Ramsbotham; Flt. Sgt. G. S. Reed; Flt. Sgt. D. Smedley; Sgt. F. Smith; Act. Sqn. Ldr. G. M. Smith, D.F.C.; Flt. Sgt. A. Stubbs; Flt. Sgt. W. H. Wall; F/O. J. Watson; Sgt. D. Wilson; Flt. Sgt. D. R Worsdale.

KILLED ON ACTIVE SERVICE.—W/O. H. J. Bays; Sgt. S. D. Castle; Flt. Lt. H. K. Crowther; Sgt. E. W. J. Dovey; Flt. Sgt. W. Forster; Flt. Sgt. F. Fraser; Sgt. G. Fuse; Sgt. T. L. Leighton; W/O. P. A. Merrall; F/O. T. J. M. Nash; P/O. J. C. Porteous; Sgt. D. R. Rowe; W/O. E. W. Skelton; Flt. Sgt. G. J. Whitcombe.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Lt. A. R. H. Palmer; Sgt. F. A. White.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/C. J. H. Crofts; Sgt. K. P. R. Motley.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—F/O. J. Zita.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—Flt. Lt. D. Clark; Flt. Sgt. K. H. C. Ingram.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. G. B. Hewison; Sgt. C. V. Jones; L.A/C. L. E. North.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. A. Doherty; L.A/C. J. H. Smith.

DIED ON ACTIVE SERVICE.—L.A/C. S. Bolton; L.A/C. R. Davies; Cpl. T. S. Dixon; Flt. Sgt. J. Hannett; Flt. Sgt. A. E. Hewick; W/O. R. Hutchison; Cpl. G. W. Johnson; A/C.1 H. G. Leach; L.A/C. A. Price; Sqn. Ldr. G. F. Rees-Jones (Med. B.); L.A/C. L. Smales; L.A/C. F. C. Watson; Cpl. J. Westgarth.

Royal Australian Air Force

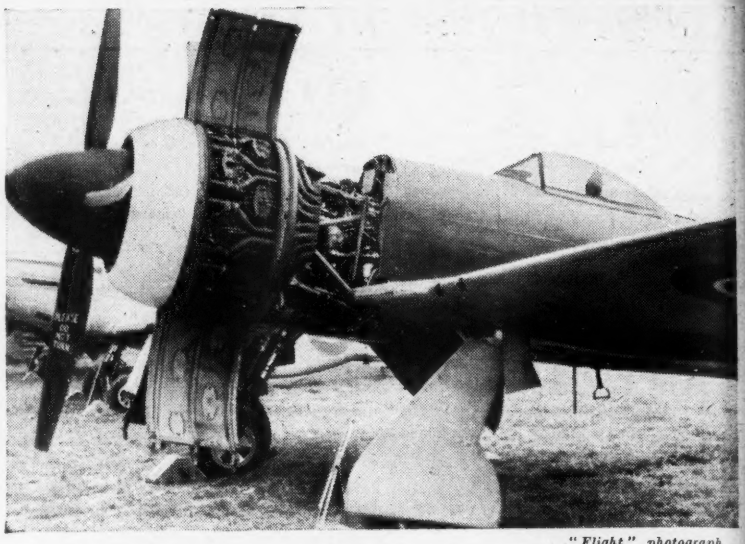
KILLED IN ACTION.—P/O. P. G. T. Hoolihan; F/O. R. L. Jenyns; Flt. Sgt. G. Kilpatrick.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—W/O. W. J. Atkinson; P/O. G. J. Atwell; W/O. A. H. Biltoft; Act. Flt. Lt. R. J. Conley, D.F.C.; Flt. Sgt. B. A. Croft; F/O. H. W. Davies; Flt. Sgt. C. S. Gay; Flt. Sgt. L. T. Hunt; Flt. Sgt. A. R. Jackson; Flt. Sgt. J. W. McLeod; Flt. Sgt. J. J. Mahoney; P/O. J. M. Mayhead; F/O. L. A. Seymour, D.F.C.; F/O. J. H. Stopp; P/O. R. G. Ward; P/O. L. H. Winnecke; W/O. J. E. Woodey.

KILLED ON ACTIVE SERVICE.—P/O. G. G. M. Smith.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. J. D. Cruikshank; Flt. Lt. M. L. Mellstrom; Flt. Lt. A. E. Scott; P/O. G. J. Storkey.



"Flight" photograph.

POWER CONCENTRATION: A photograph showing clearly the compact installation of the Centaurus engine in a Tempest II.

"Flight" photograph.

HIGH-ALTITUDE RADAR: A Westland Welkin fighter with a radar extension fitted to the nose.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. J. N. Almond; P/O. J. E. J. G. Arbour; F/O. E. H. Barbet; Sgt. S. P. Beech; F/O. N. Bernett; F/O. H. J. P. Brennan; P/O. G. W. Brockway; W/O. C. H. Coathup; Flt. Sgt. G. A. Coon; P/O. F. W. Dolter; W/O. W. W. Duncan; F/O. J. Feldman; Flt. Sgt. E. J. Firth; P/O. J. V. J. Gravel; Flt. Sgt. S. W. Hans; W/O. E. O. E. Humphreys; P/O. A. Hutton; Sgt. W. J. Jeffrey; P/O. J. H. Jones; P/O. J. W. Kellie; F/O. G. P. J. Kimmins; P/O. J. G. G. Lamarre; Sgt. M. B. Leboldus; P/O. J. M. B. Liebscher; P/O. R. W. Lowther; P/O. J. R. McWade; W/O. G. J. Overend; P/O. E. J. Richardson; P/O. H. H. Rodgers; Sgt. N. C. Rushton; Flt. Lt. J. W. Saville; F/O. H. G. Taverner; P/O. G. H. Taylor; P/O. N. C. E. West; P/O. N. A. Wilson.

MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. J. A. Burkitt; Flt. Lt. E. L. Holden.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. D. S. J. Bowman.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. J. R. Baril; F/O. E. D. Brydon; F/O. A. J. Dilworth; F/O. D. F. Grose; Flt. Sgt. R. J. Leonard; F/O. P. J. McNair; Flt. Lt. L. E. Taylor; Flt. Sgt. L. E. Whalen.

MISSING.—F/O. L. H. Amos; F/O. D. G. Baker; Flt. Lt. J. N. G. Dick; F/O. R. M. English; Flt. Sgt. K. G. W. Henderson; W/O. P. E. A. Heinrich; Flt. Sgt. L. U. M. Hiatt; Flt. Sgt. A. F. Juby; F/O. J. M. Larkin; F/O. J. R. Liddell; F/O. T. C. Robson; Flt. Sgt. J. J. P. R. Roy.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Lt. R. B. Ashley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. R. P. Cummins; Flt. Lt. D. E. Jenvey; Sgt. J. M. Logelins; P/O. E. W. Michie; Sgt. G. H. Nelson; F/O. G. J. Palsen; Sgt. R. S. Piers; Sgt. T. F. Scott; Sgt. F. C. Stevens; F/O. E. H. Widdess.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. K. McE. Davidson; F/O. W. M. Reid.

DIED ON ACTIVE SERVICE.—L.A/C. J. D. M. Bedard; L.A/C. R. F. Charbonneau; Flt. Sgt. J. S. McDonald.

Royal New Zealand Air Force

KILLED IN ACTION.—F/O. C. P. D. Childs; P/O. J. R. Moffat; F/O. B. C. Robinson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. G. Philp.

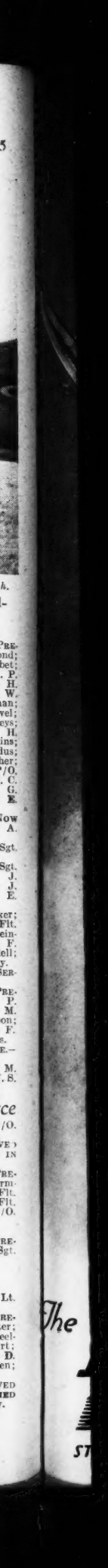
PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. C. A. Armstrong, D.F.M.; Flt. Sgt. R. D. E. Betley; Flt. Sgt. T. R. Donaghy; Flt. Sgt. K. W. Gower; Flt. Sgt. J. S. Miller; P/O. R. J. Thornton; P/O. B. W. Windsor, D.F.M.

MISSING.—W/O. R. G. Dawson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. C. R. Leslie.

South African Air Force

KILLED IN ACTION.—Lt. J. K. Du Preez; Lt. R. Good; Capt. H. C. Murman.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—2/Lt. W. C. Carter; W/O. Daleski; 2/Lt. M. Davis; Lt. A. F. Deelman; 2/Lt. A. S. Hogden; Lt. W. C. Joubert; 2/Lt. G. Mervis; Lt. N. H. M. Stead; Lt. C. D. Sumner; Lt. A. Steward; 2/Lt. P. J. Van Staden; Lt. A. E. Wallem.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Lt. J. H. Glenny.